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the OIL AND GAS JOURNAL

PUBLISHED WEEKLY JULY 6, 1959

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LPG flood kicked off in Bisti ▸ 72

Stage set for Persian Gulf test ▸ 88

Computer keeps tabs on profits ▸ 110

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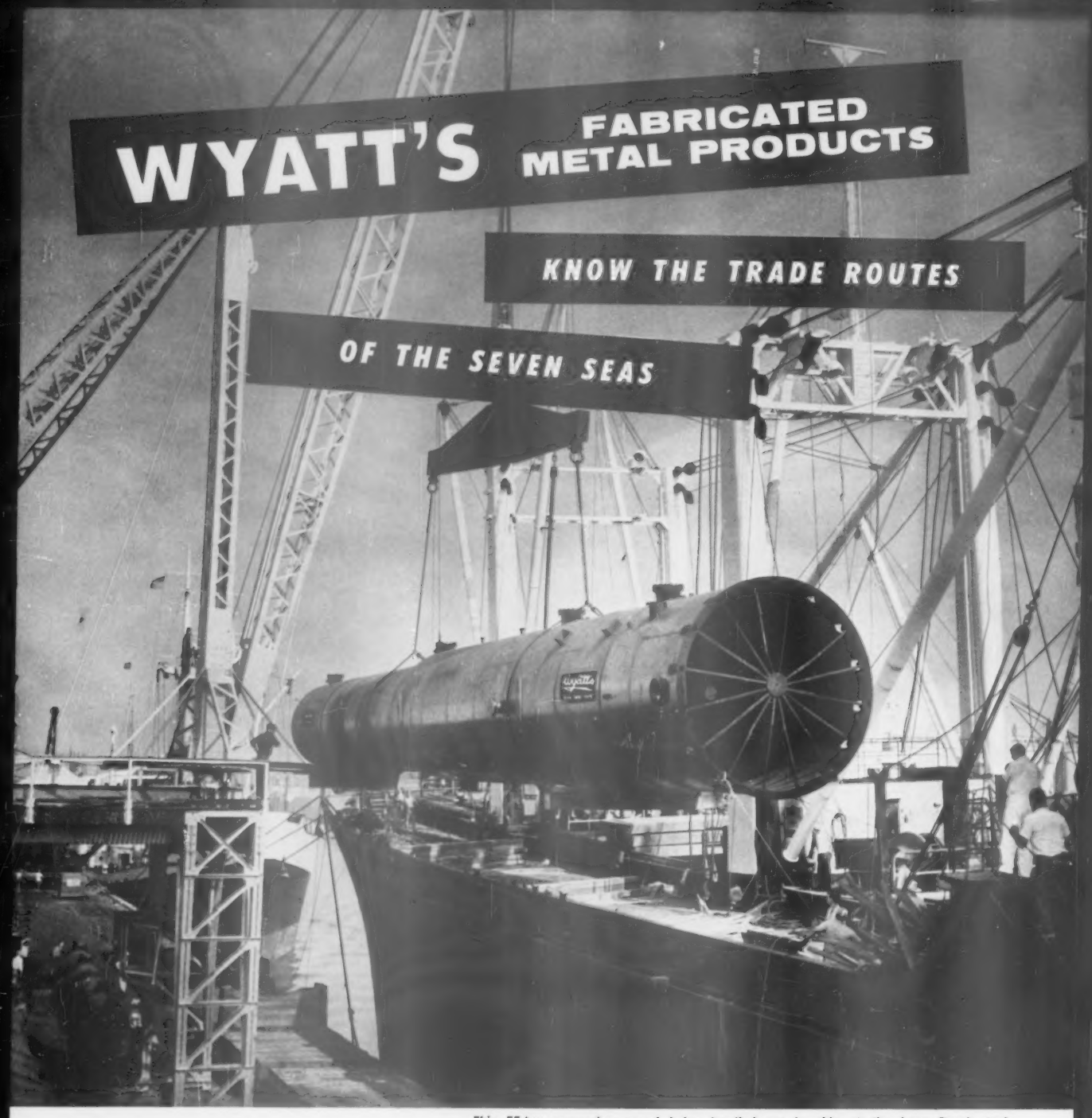
DIRECT-CONTACT INTERSTAGE COOLING p. 96



This 55-ton processing vessel being handled car to ship at the Long Reach dock, port of Houston, for foreign service.

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The OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
July 6, 1959

Bisti miscible-phase project paves way for others:

New Mexico's first LPG flood has been launched. Sunray Mid-Continent is operator (Details, p. 72).

The unit covers 7,300 acres in center of Bisti field. Estimated total recovery: 12,000,000 bbl. That's double the amount of oil recoverable by primary means.

The operation follows a pilot flood. It's expected to return a profit of about $10 for each $1 invested.

Look for the project to spur secondary recovery activities in other areas of the huge field.

Chile will keep its back turned to foreign oil firms. A congressional bill authorizing concession awards in northern provinces was quashed by leading Radical party. It was done by special vote reaffirming existing state oil monopoly.

A $50-million loan is being sought by owners of Hassi Messaoud field.

The money is needed to complete 387-mile 24-in. crude line to Bougie on Mediterranean coast of Algeria. SN Repal and CFP(A) are negotiating for loan with U. S. banks and World bank. The line is slated to open this year.

▼ ▼ ▼

U. S. oil import quotas on country-by-country basis—sought by Venezuela—isn't in the picture.

Interior Sec. Seaton told press conference last week he opposes such a system. His statement confirms earlier, unofficial comments indicating Eisenhower administration is cool toward Venezuela's plea.

Seaton declined to say whether he foresees other major changes in imports program the second half of year. His reticence lends weight to assumption that another overhaul is being discussed.

Focal point for crude-oil movements shifts from Sarnia to Toronto area. The reason: Opening of St. Lawrence Seaway.

Canadian crude previously met U. S. crude in Sarnia sector. Now, it's possible to ship crude either from Middle East or Venezuela into Toronto. Venezuelan crude at posted

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prices can be laid down in Toronto slightly below Canadian oil. However, size of tankers and closed winter period of navigation should lessen impact on Canadian crudes.

Products could be affected more adversely by the seaway. Occasionally, products are purchased in Caribbean area on spot basis at distress prices. These could now find their way into the Ontario market.

If this trend should swell to threatening proportions, look for some form of governmental restrictive action.

Look for Interior Department to renew efforts to get congressional authority to carry out long-range helium-conservation program.

Sec. Seaton wants authority to sign long-term contracts with private industry to build and operate 12 more helium-recovery plants. Congress turned down similar program last year.

Demand for helium is growing rapidly. Interior wants to conserve at least part of helium now being wasted at rate of 4 billion cubic feet per year. Loss occurs when helium-bearing natural gas is burned without extracting helium.

▼ ▼ ▼

Spraberry trend operators are edging closer to unitization.

Best guess now is that at least one huge flood will be kicked off within the next year. Sohio could be the front-runner. Indications are the Sohio unit will take in around 60,000 acres. That would make it the biggest in the U. S.

Biggest stumbling block to unitization in Spraberry is that of adjusting investments. Much proved acreage isn't fully developed. This is causing fussing between these blocks and those fully developed over investment adjusting, since unitizers are talking straight-acreage participation. Several proposed units now are confronting this problem.

Outlook: Investments headache will delay floods much longer than operators would prefer.

▼ ▼ ▼

Pollen and spores—a plague to hayfever sufferers—are becoming more and more important to oil.

More and more oil-company research is directed at study of the minute objects, termed polospores. A boon to geologists, the tiny fossil dwarfs are useful for:

...Quick dating of sediments and for correlation and zonation.

...Outlining ancient shore lines, a favorable environment for oil (p. 165).

Southern Michigan gas strike points to possible parallel productive trend to 17-mile-long Jonesville to Albion (Scipio) play.

The wildcat is Bell & Gault 1 Bissell, 7 miles east of Pulaski pool. It gaged 3,840 M.c.f. of gas in Trenton dolomite at 3,980-4,009 ft.

The gas pay correlates with gas cap overlying oil zone in developed area.

The Japanese are going for broke in their concession off the Neutral Zone.

Arabian Oil is undaunted by lukewarm financial backing and limited drilling know-how. It's about to spud its first well—an 8,000-ft. Arab zone test in 102 ft. of water. And the company already has staked locations for second and third wells (p. 88).

Drilling activity is booming in Wyoming.

There are 98 active rigs in the state. The rig count—highest since big Clareton development several years ago—compares with last year's top of 82.

All of Wyoming's basins are busy, particularly Wind River, Big Horn, and Green River.

▼ ▼ ▼

Renewed attention is being given here and abroad to use of the pipeline itself for data transmission—rather than wire line or radio communications. Technique actually is being used for short distances on Italian gas lines.

Foreign competition is becoming more and more a thorn in the side of the U. S. steel industry.

German pipe is being shipped to Texas for a 104-mile 18 and 20-in. gathering line planned by South Texas Natural. It's being supplied by the Mannesmann mills of Dusseldorf.

Stiffer competition from abroad is an industry argument against steelworkers' wage settlement which would boost steel prices. Oil has big stake in steel company-union negotiations—which now have July 15 deadline.

Canada's natural-gas requirements will nearly treble by 1970. By 1980, production should top two trillion cubic feet or more than eight times last year's withdrawals.

Those are predictions of John Davis, economist for British Columbia Electric Co. He told Canadian Gas Association that prospects are bright for finding enough reserves to back up these demands.

At projected demand rate, reserves of 75 trillion would be needed by 1980. As for Canada's longer range potential, Davis said perhaps the industry should be thinking not of a mere 150, but more like 500 trillion cubic feet.

▼ ▼ ▼

Here's a switch: Refiners cut crude runs 164,000 bbl.

daily for week ended June 26. But they made more gasoline than the week before.

Runs dropped from 8,000,000 bbl. daily to average of 7,736,000 bbl. At same time, gasoline production increased 14,000 bbl. daily.

Gasoline stocks decreased 2,353,000 bbl., but middle distillate inventories climbed 4,674,000 bbl.

Refiners must have had a big chunk of crude-import quotas left for last half of June.

Crude imports the last 2 weeks of June averaged 1,235,000 bbl. daily. That's the highest 2-week average since early September 1957.

Work assignment and job classification issue has led to two more refinery strikes (p. 69).

American Oil's plants at Texas City, Tex., and El Dorado, Ark., were shut down when OCAW and management couldn't agree on the issue.

New twist in anti-smog weapons—a smogless auto.

Union Oil of California proposes new approach to critical smog problem in Los Angeles. It claims tests show simple modification of auto fuel system cuts carburetor and gas-tank evaporation losses from 90 to 95%. That would mean 20 to 30% less hydrocarbon loss from cars in Los Angeles daily (p. 85).

Want a bang-up job? Then follow example of one refiner who used explosives to dislodge coke deposits accumulated in cat-cracker reactor during a long run.

The small charges were used during turnaround to break up the hard coke formations. Total elapsed time: 80 hours compared to normal time of weeks for the job.

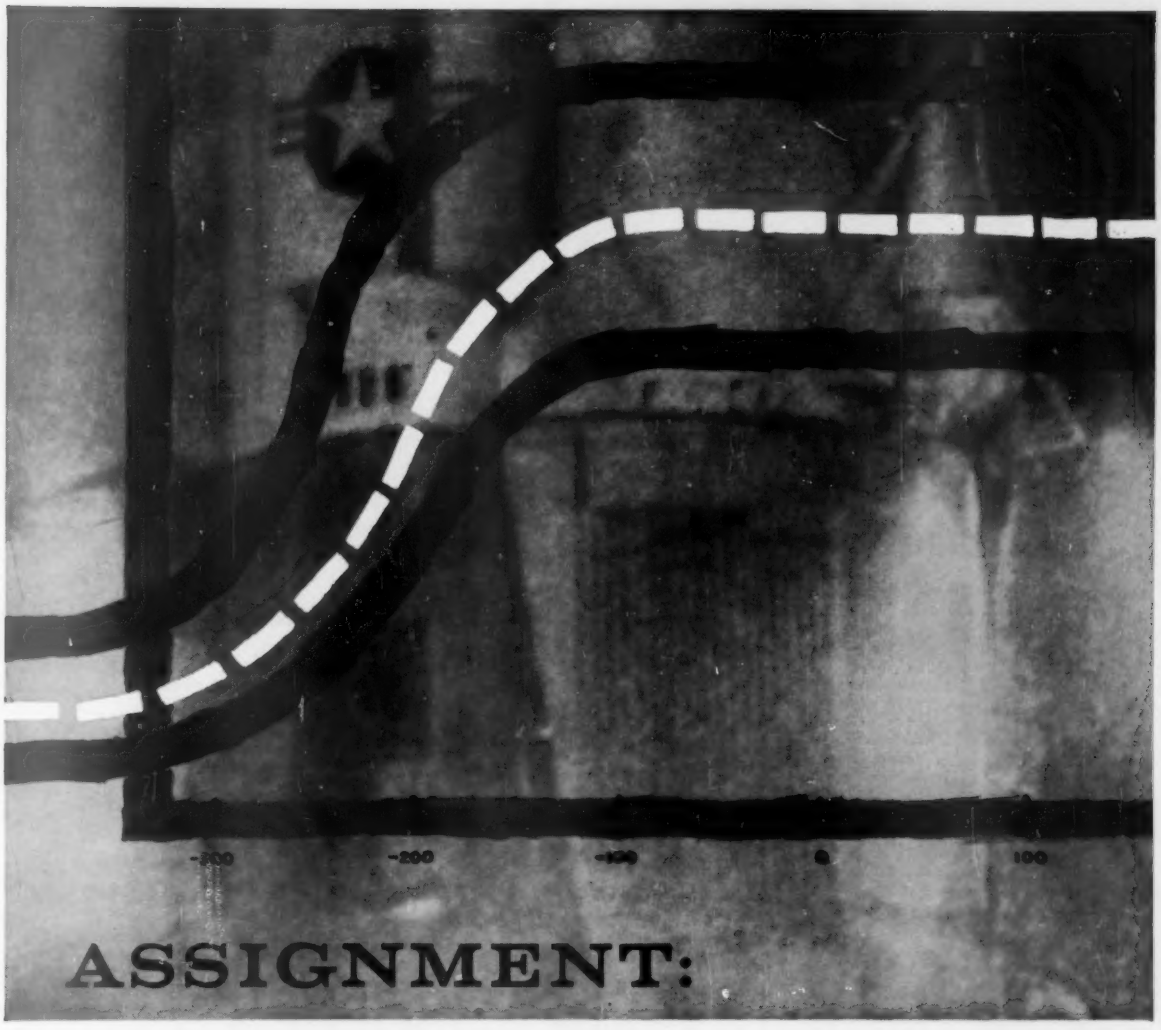
Should a company use its retired executives on a consulting basis?

The answer to that question was split about 50-50 among 278 manufacturing firms polled by the National Industrial Conference Board.

Half the firms have retired officers and directors serving as consultants. Their reasoning: Judgment and experience contributed by former executives is worth the price.

Many of those against it feel lingering presence of retired officers lowers morale of younger men who replaced them. Some think retired executives lack incentive.

Arrangements differ widely among companies with retired employes as consultants. Most have formal consulting agreements with former executives to serve on stand-by basis in advisory capacity for specified term and retainer fee. Only one-eighth of firms surveyed appoint retired officers to company committees.



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TECHNOLOGY—OPERATION

Pipelining

Direct-Contact Interstage Cooling in Compression 96

By W. S. Stewart and R. L. Huntington

Large savings appear possible both in power and heat-exchange costs by cooling natural gas between compressor stages through direct contact with water. For example, direct cooling would save $24,000 per million standard cubic feet per hour for compressor investment alone. Heat and mass-transfer coefficients for the air-water system are presented.

Sea Transportation of Petroleum 106

By L. F. Kahle and A. J. Kelly, Jr.

Out of every 10 bbl. of petroleum consumption in the United States, 3 or 4 bbl. are moved by sea transportation somewhere along the way. Dependency of foreign oil consumers is much greater.

Chromium-Plated Machine Parts Last Longer 136

By Dan Haack

Mid-Continent Pipe Line Co. chrome plates a great many components of pipeline machinery. Engine-cylinder liners, reciprocating-pump liners, engine and pump crankshafts, pump piston rods, pump crosshead pins, and engine camshafts are a few of the many applications.

Production

New Skid-Mounted Flood Unit Is Efficient, Automatic 122

By W. B. Bleakley

The unit has been placed in service by Graybol Oil Corp. in East Francis field, Pontotoc County, Oklahoma. It handles 4,000 bbl. of water per day at 1,000 psi. It is completely salvageable, and all equipment is on one skid.

Carter Licks a Multizone Water-Flood Injection Problem 123

By D. E. Shupp

Multiple completion of water-injection wells permits segregated injection, controls water flooding in multiple-pay fields, and minimizes development cost and operating life. Carter's experience with multizone water floods puts the stamp of approval on two and three-zone injection installations.

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Calcium-Treated Muds Slash Drilling Costs 102

By J. A. Gill and W. M. Carnicom

There has been a minor revolution in drilling mud in South Louisiana during the past 2 years. New inhibited muds are paying big dividends in low mud costs.

New Tool Is Effective for Lost Circulation 129

By B. E. Yester

It has been designed to block off large fractures, crevices, or caverns into which large volumes of cement or other materials can be pumped without success.

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The Journal's refinery construction cost index and refinery operating cost index.

Computer Keeps Tabs on Profits 110

By Lee A. Whitney

Use of a digital computer at the Champlin refinery enables the company to maintain profits at a maximum by evaluating rapidly effect of changes in operations on cost, yields, and revenue.

Computer Solves Material and Economic Balance Problems 117

By Ralph Landes and Earl Walker

The electronic computer enables Champlin to make complete balances over the entire refinery, and in reasonable time. These balances aid materially in gasoline blending and in determining operating conditions.

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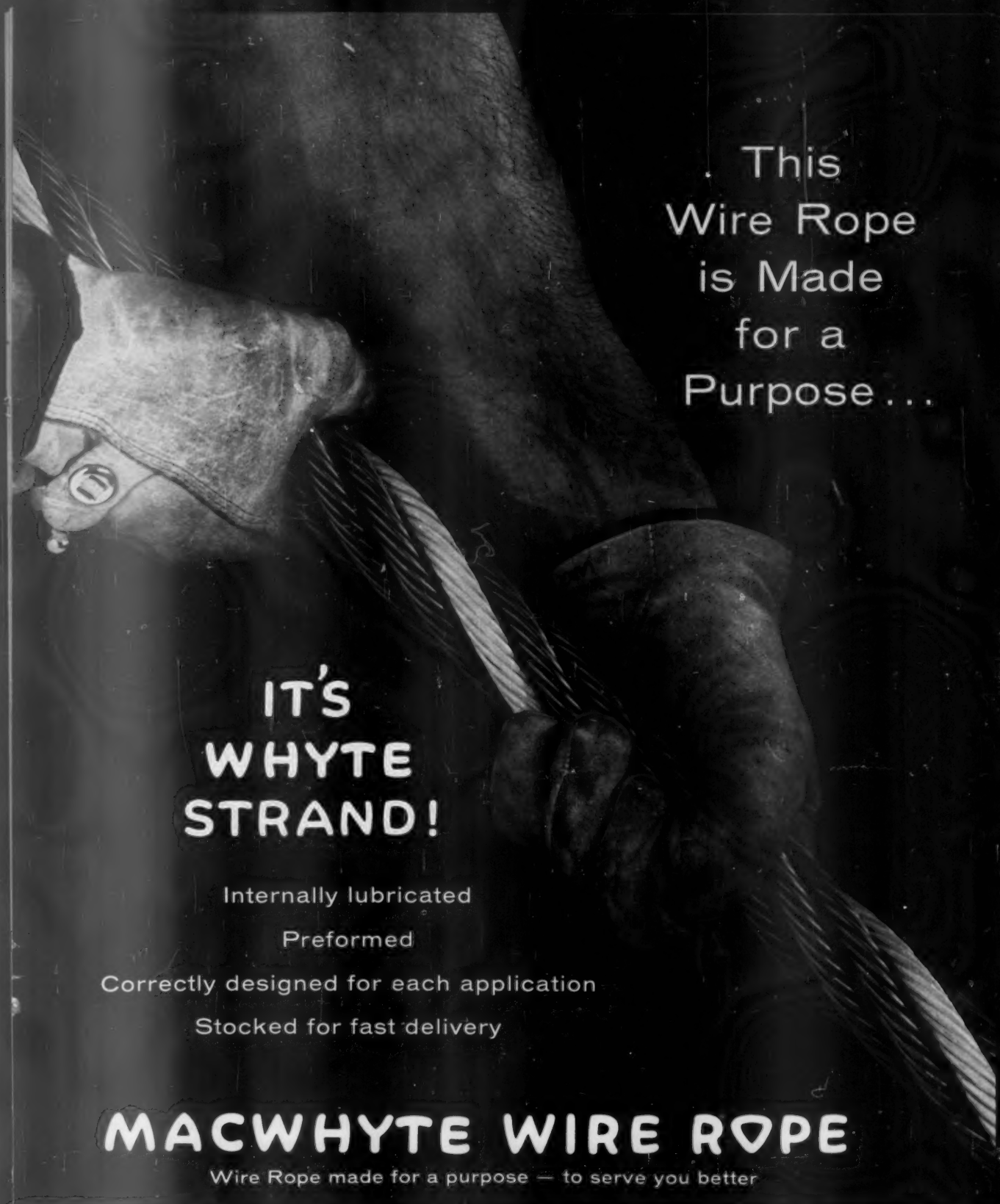

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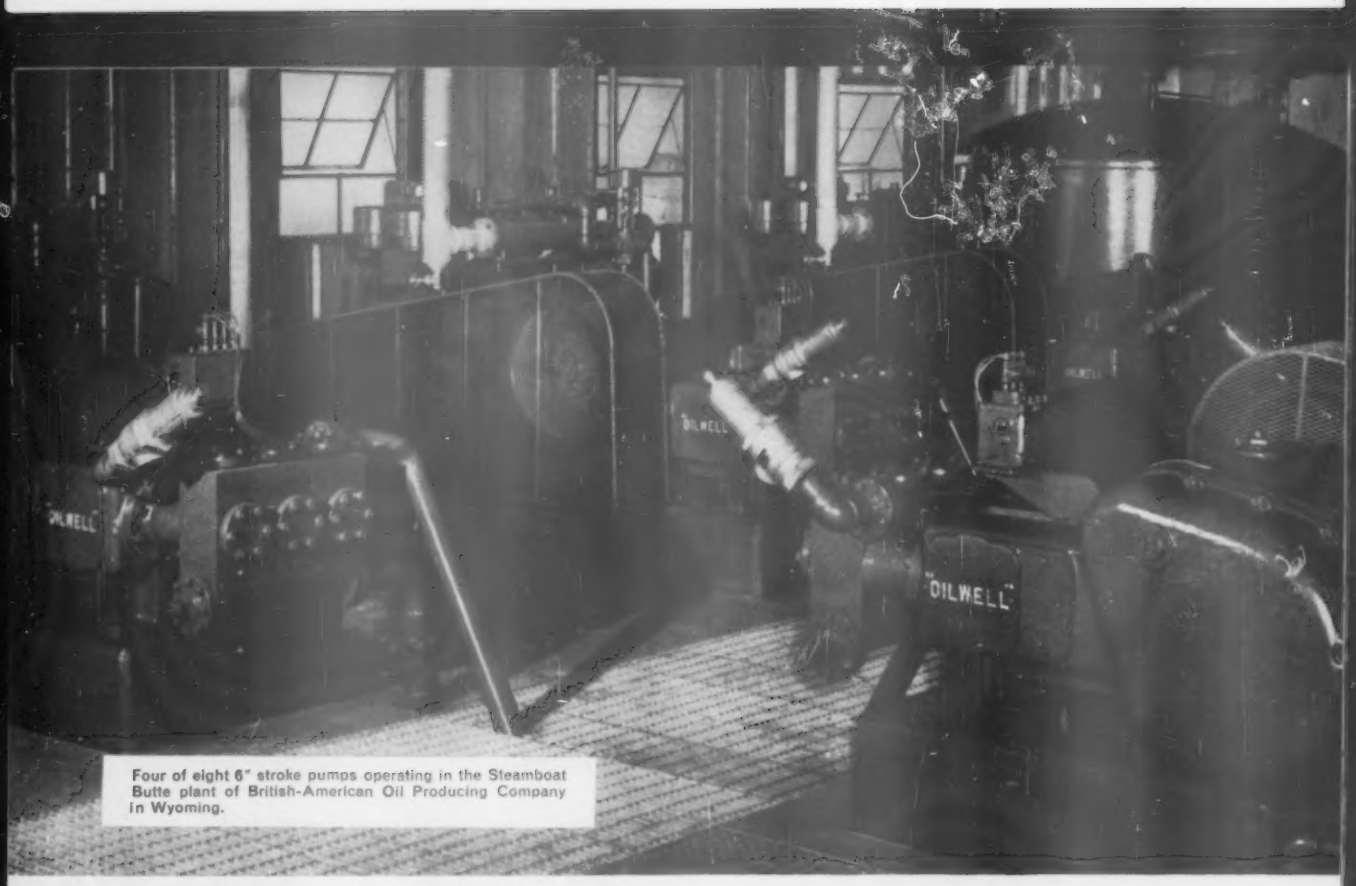

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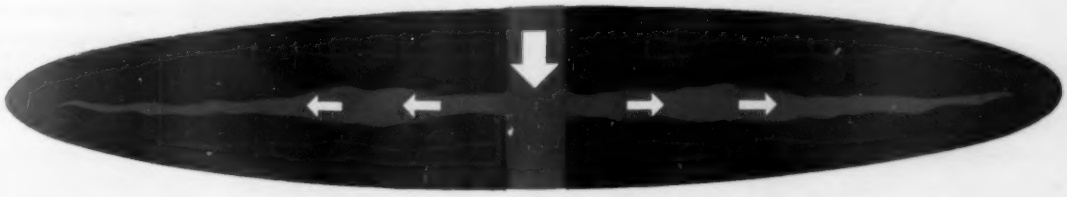

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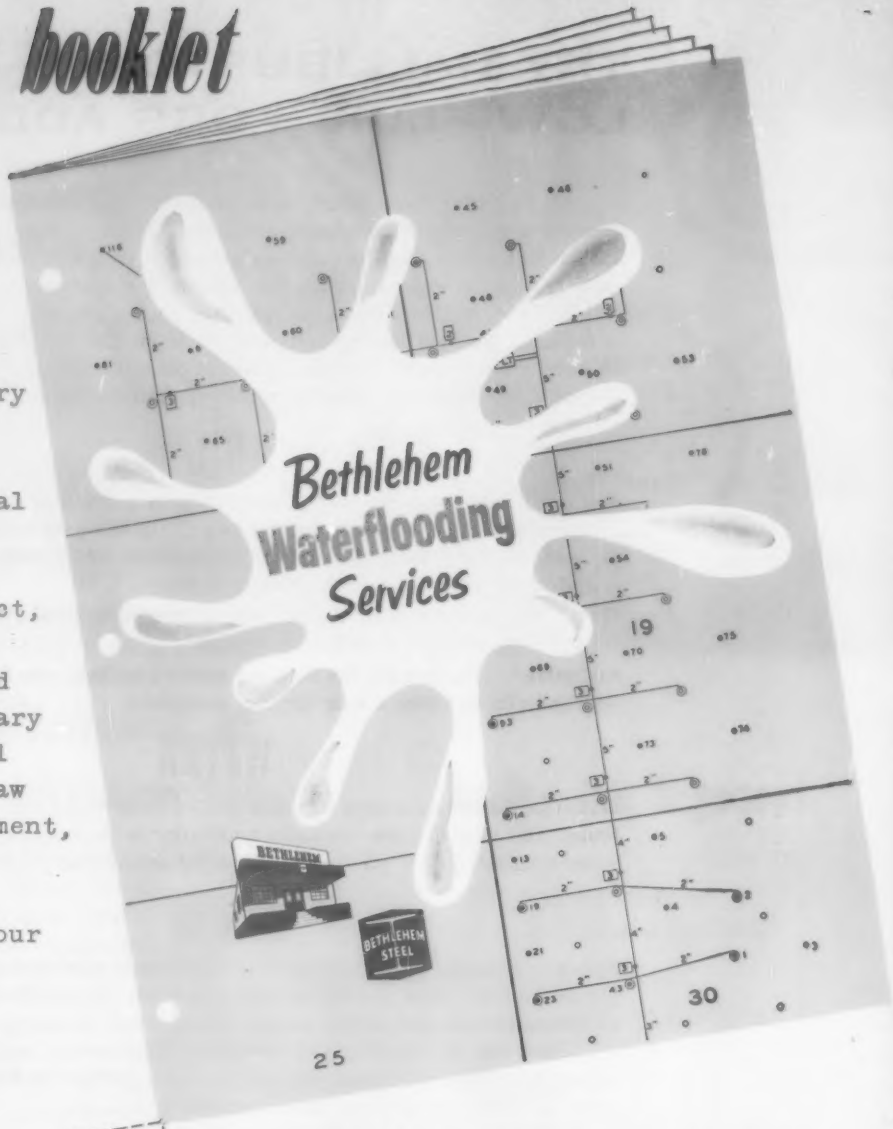

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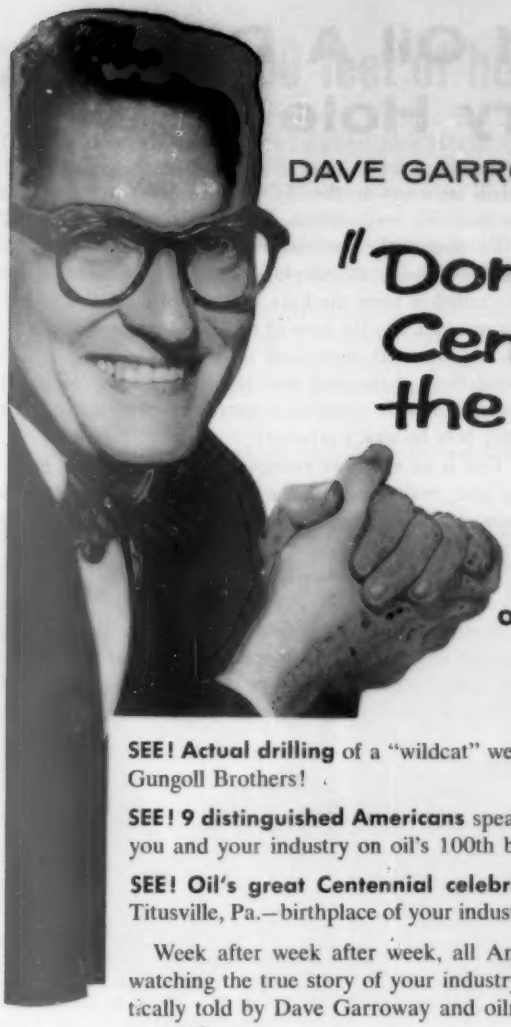

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SEE! Oil's great Centennial celebration in Titusville, Pa.—birthplace of your industry!

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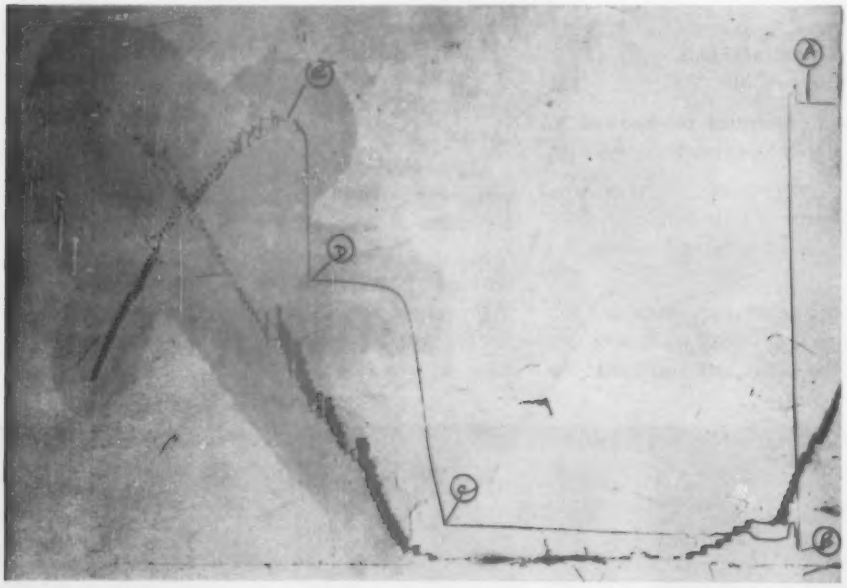
168 Barrels Of Oil A Day From A Dry Hole

This is the story of how an apparent dry hole was made a 168 bopd producer. The well was drilled by Mr. A. C. Torgeson of Torgeson Oils, Inc. who realized a successful producer from a wildcat well that could easily have been abandoned. The well was spudded in Weld County, Colorado, and was projected for the "J" sand around 6900 ft. The sand, when reached, was cored and an electric log was run. These revealed conclusively that the "J" sand was unproductive . . . that it contained only water. Had it not been for the alertness of the consulting geologist on the well, Paul "Skipper" Keller, the well would have been plugged and abandoned. Keller, however, had noticed an oil show in the cuttings from the "D" sand approximately 100 feet up the hole. The "D" sand was generally unproductive in the area and a thorough study of all available evidence indicated that it probably would be unproductive in this well even though there was a show in the cuttings. Normally a well of this type would have been abandoned immediately, but Mr. Keller was reluctant to do this in spite of the seemingly overwhelming odds against making a successful producer. The decision was then made to run a drill stem test on the "D" sand in order to evaluate all the available information. The result was a producer!!!

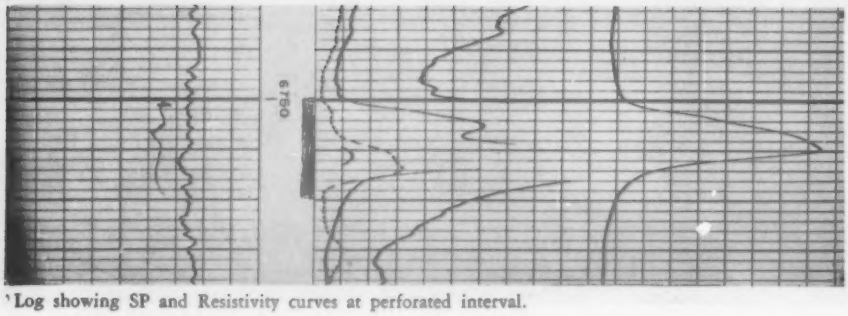
To obtain the test information which resulted in a positive decision to complete the well, Johnston Testers was called in from the Fort Morgan office and a straddle test was run. On the basis of the drill stem test, casing was set and the well perforated from 6758 to 6764 ft. The initial flow of the well was 168 bopd through a 30/64" choke. No well stimulation treatment was required and a dry hole became a producer.

This is an excellent example of the necessity of gathering and evaluating all the data possible before setting casing on a well that might be dry, or before abandoning a possible producer.

This well clearly demonstrates that it is unwise to discount any possible pay or write-off any well prematurely. It also demonstrates that Drill Stem Testing pays off in handsome dividends. The cost of a drill stem test is very small compared to the investment made in the drilling of the well. Test—to be absolutely sure.



Drill Stem Test chart for the Torgeson State No. 1. Tool was open for two hours with forty-five min. shut-in. Gas to surface in 18 min. (800,000 cu. ft.) and a good blow was observed. 550 ft. of oil and 270 ft. of oil and gas cut mud were recovered. No water was present. Initial flow (B) was 108 psi and final flow (C) was 291 psi. Final shut-in pressure (D) was 2221 psi.



Log showing SP and Resistivity curves at perforated interval.

JOHNSTON DRILL STEM TESTING TESTERS

Chewed 213,000 feet of hole through Permian Basin rock

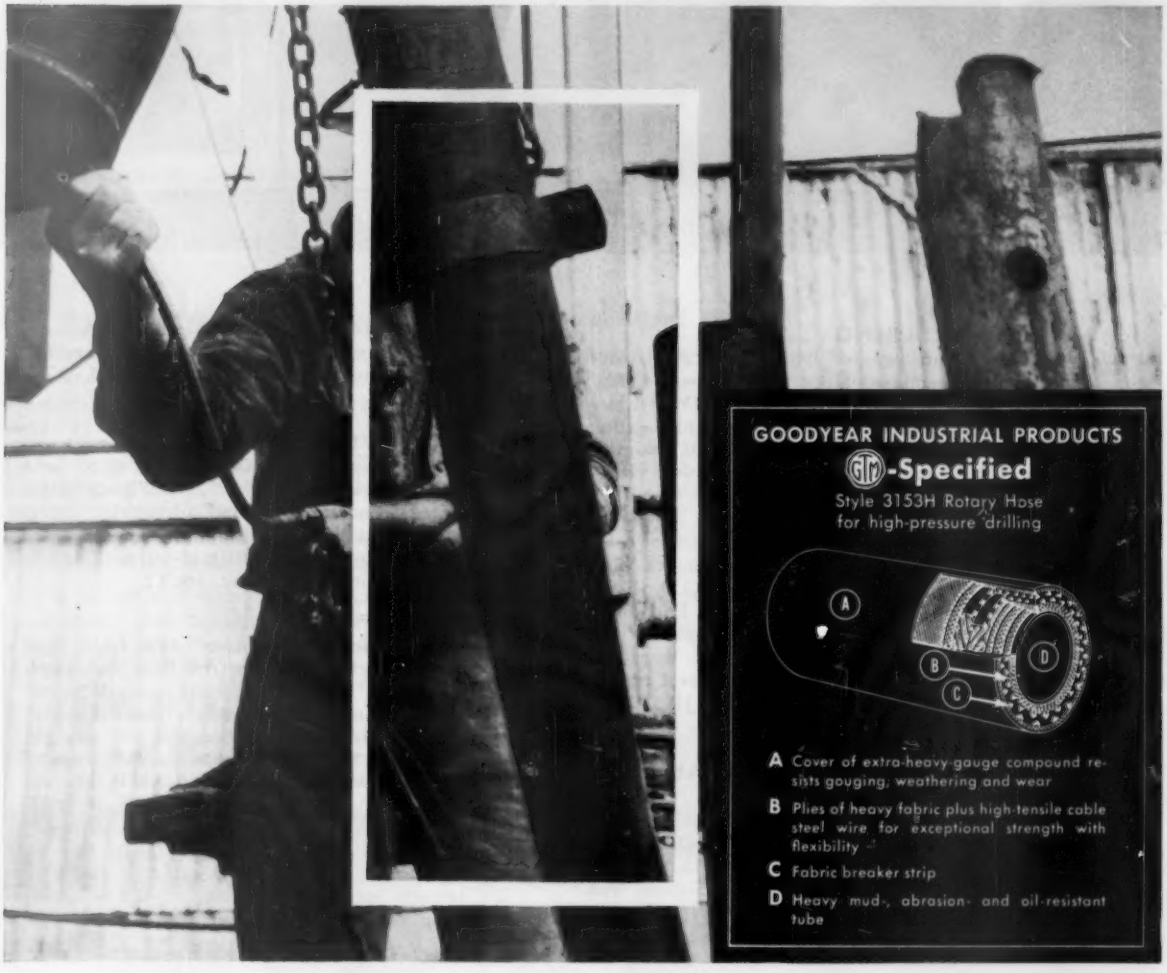
Drilling through some of the toughest rock strata in all Texas has made short work of many a rotary hose. But the G.T.M.—Goodyear Technical Man—had no qualms when he recommended Style 3153H Hose. He knew its steel-cable-reinforced construction—factory-tested to 5,000 p.s.i.—could take on the severest oil-field service.

Yet even the G.T.M. didn't figure on the kind of punishment in store for this hose. For the operator decided to try the relatively new air-drilling technique—even though hot air, blasted through at high velocity, inevitably means shorter hose-life.

The result? At last report, the G.T.M.'s hose had drilled 34 wells—213,000 feet of hole. And a good deal of that was tough air-drilling.

But that's typical of the outstanding performance you can expect from all Goodyear hose—engineered for every phase of the oil industry. For the full story on any type, contact your G.T.M. through your Goodyear Distributor—or by writing Goodyear, Industrial Products Division, Akron 16, Ohio. • • •

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*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GTM-Specified
Style 3153H Rotary Hose
for high-pressure drilling
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B
C
D
A Cover of extra-heavy-gauge compound resists gouging, weathering and wear
B Plies of heavy fabric plus high-tensile cable steel wire for exceptional strength with flexibility
C Fabric breaker strip
D Heavy mud-, abrasion- and oil-resistant tube

ROTARY DRILLING HOSE BY

GOODYEAR

THE GREATEST NAME IN RUBBER

- **CACTUS CASING . . .**
"Heads the 'most wanted' list!" Electric Resistance Weld and Seamless. Sizes: 4½" through 13⅜" O.D. (EW), 4½" through 9⅝" O.D. (SMLS). Finish: black. End finish: threaded and coupled—long or short couplings; threaded; plain end. Lengths: Ranges 1, 2, and 3. Specs: API. Grades: H-40, J-55 (EW); J-55, N-80 (SMLS).

- **TUFFY TUBING . . .**
"Prepared for any job!" Electric Resistance Weld and Seamless. Sizes: 2⅜" through 3½" O.D. (EW), 2⅜" and 2⅞" O.D. (SMLS). Finish: black. End finish: Non-upset—Plain end: threaded, threaded and coupled; External Upset—Plain end: threaded, threaded and coupled. Lengths: Ranges 1 and 2. Specs: API. Grades: H-40, J-55 (EW); J-55, N-80 (SMLS).

- **WYATT ELECTRIC RESISTANCE WELD . . .**
"Associates with FARROWTEST—the best electronic detective in the business!" Standard and line pipe. Sizes: 8⅝" through 16" O.D. Weights: standard, extra strong, and miscellaneous and plain end weights. Finish: black, galvanized. End finish: threaded and coupled; threaded; plain end beveled or square cut; Victualic grooved. Lengths: single, double, ½ and ⅓, random lengths, and cut lengths. Specs: ASTM, API, U. S. Federal, etc. Grades: A, B, X-42, 46, 52.

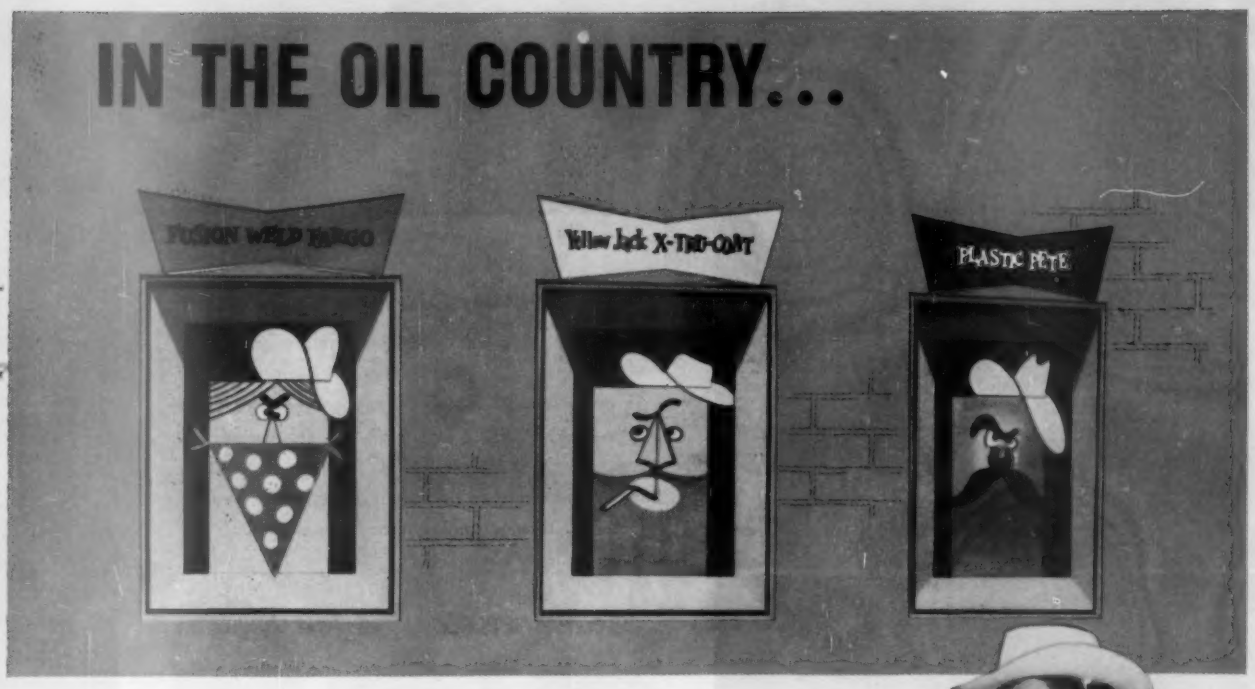
- **BIG BILL BUTTWELD . . .**
"Long record of successful operations!" Standard and line pipe. Sizes: ⅛" through 4". Weights: standard, extra strong, double extra strong. Finish: black, galvanized. End finish: threaded and coupled; threaded; plain end beveled or square cut. Lengths: uniform 21' lengths; cut lengths; and random lengths. Specs: ASTM, API, U. S. Federal, etc.

- **FUSION WELD FARGO . . .**
(Alias Super Span) "Eliminates every third field weld!" Sizes: 24", 26", and 30" O.D. Finish: black (uncoated). End finish: plain end beveled, plain end square cut. Lengths: Random—approx. 30'; double random—approx. 60' (mid-welded). Specs: ASTM, API. Grades: B, X-42, 46, 52.

- **PLASTIC PETE . .**
"Things just don't bother him!" *SRK (ABS Type I and II).* Weights and sizes: 100 lb.—1" through 6"; 150 lb.—½" through 6"; extra heavy IPS—½" through 6"; American Gas Association size—½" through 4". Finish: black. Lengths: 20' straight lengths. *SRB (Semi-Rigid Butyrate).* Sizes: 2" through 6". Weights: standard SWP. Finish: black. Lengths: 20' straight lengths. *FE (Flexible Polyethylene).* Weights and sizes: standard—2" through 6"; 75 lb.—½" through 1½": 100 lb.—½" through 1½". Finish: black. Lengths: 4" and 6"—25' straight lengths; ½" through 3"—in coils (for coil lengths, see price card).

- **YELLOW-JACK X-TRU-COAT . . .**
"Protects his steel body with a tough polyethylene coat!" Sizes: ¾" through 4" Continuous Butt Weld; 2⅜" through 5⅝" Electric Resistance Weld. Weights: Standard, extra strong, miscellaneous. Finish: applied to black or galvanized. End finish: threaded and coupled; threaded; plain end beveled or square cut. Lengths: uniform 21' lengths, cut lengths, and various random lengths. Grades: A, B in Electric Resistance Weld.

IN THE OIL COUNTRY...



. . . you saw them at the International Petroleum Exposition!

Chances are you saw the seven "most wanted" characters behind bars at the International Petroleum Exposition. Republic had 'em jailed for all the world to see. But the fact is, these hombres are now on the loose . . . ready to tackle any job . . . able to deliver the goods!

They're tough and rugged, these Republic Steel Tubular Products, and ready for action. But there's a dollars-and-cents reward for catching any or all of them. These hombres are *wanted* by oil men because they give the assurance of utmost quality . . . quality needed to perform specified jobs dependably and at lowest possible cost.

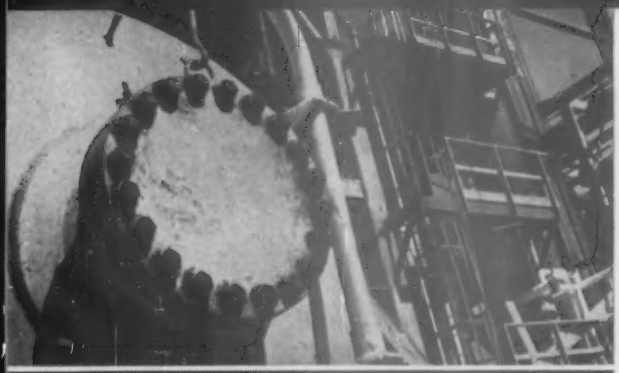
Go after 'em yourself. Partial descriptions are on the opposite page. For complete information, gallop down to your Republic distributor or pony express us the coupon on the following page!

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

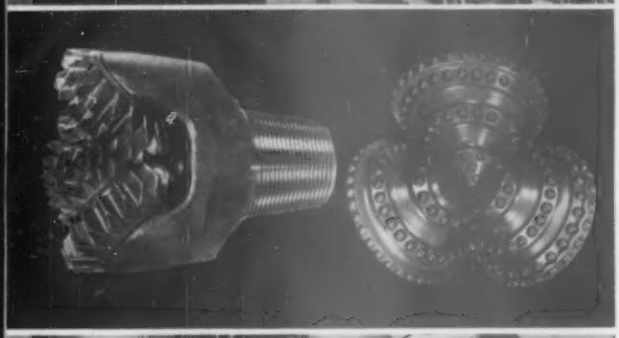
AND NOW! FARROWTEST®, an electronic method of non-destructive testing. The display model at left was exhibited at the International Petroleum Exposition. FARROWTEST supplements other standard tests in the production of Republic Electric Resistance Weld Line Pipe in sizes 8⅝" to 16" O.D. A proved production safeguard, FARROWTEST offers *quality you can actually measure* . . . assures detection of all critical defects!

from



...Powerful, Clamping Action

High-strength Republic Alloy Studs and High Carbon Hex Nuts provide safe, leakproof performance on high pressure equipment. Withstand massive force applied continually or cyclically—without distortion, creep, stretch, or fatigue failure. Full formed, accurate threads allow nuts to be pulled up tight and backed-off quickly to meet maintenance requirements.



...Stubborn Resistance to Wear

Republic Alloy Steels are exceptionally tough and durable. Resist shock, abrasion, and fatigue of round-the-clock operations. Higher strength-to-weight ratios, with no sacrifice in strength or safety, make them ideal for use in gears, shafts, bearings, tools, and equipment like these extremely hard and tough drilling bits.

...Fast, Low-Cost Installations

Republic Plastic Pipe is easily cut and joined in seconds using handsaw, brush-applied solvent, and slip-type couplings. Plastic pipe eliminates corrosion problems. Withstands severe impact yet is exceptionally light-weight. Republic produces a complete range of sizes in SRK (Semi-Rigid A.B.S.), SRB (Semi-Rigid Butyrate), and FE (Flexible Polyethylene). Send for facts.

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Please send more information on:
Seven "most wanted" characters in the oil country:

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☐ Continuous Butt Weld ☐ X-TRU-COAT ☐ Plastic Pipe
☐ FARROWTEST electronic testing ☐ Alloy Steel Studs and Hex Nuts
☐ Alloy Steels

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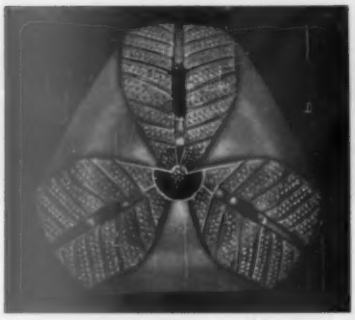
REPUBLIC STEEL

WITH THE NEW TRI-Y DIAMOND BIT

. . . . . another D&S design advance for faster, deeper drilling . . . . . .



Again D&S sets the industry pace with new TRI-Y design diamond bits. In pressure compacted sands and hard abrasive formations D&S has proved once more that advance engineering and custom designing give you faster penetration rates and maximum efficiency for less.

CHECK THESE PREMIUM FEATURES

- **Reduced diamond concentration allows maximum use of mechanical energy.**
- **New design eliminates center . . . allows it to crush and wash out through large side port — eliminates re-grinding center.**
- **Minimizes sticking hazard from mud wall cake.**
- **Permits washing out large pieces of junk iron, minimizing that hazard.**

WRITE OR CALL TODAY! One of our sales engineers will call on you and explain this revolutionary new Diamond Bit.

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World Wide in Scope — Local in Know How and Service

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Ultra Fine Diamond Equipment for the Oilfield

Putting the Laurel to bed

That's The Laurel Pipe Line! *Recently completed, this 440-mile line is the first to use 24-inch-diameter pipe in a major cross-country refined products system.*

Gasoline and other petroleum products will be transported through the line from Delaware River Valley refining centers to inland marketing areas such as Reading, Harrisburg, Pittsburgh and Cleveland.

National Tube supplied the pipe for the Laurel Line—approximately 66,000 tons of USS National Seamless and Electric Weld Line Pipe in sizes 24" O.D. to 14" O.D. for the main line and 9,000 tons for feeder lines, take-offs, and terminal facilities.

The eastern section of the main line, some 135 miles, is 24" diameter, API 5L X-52 pipe, ranging from .281 to .375-inch wall thickness. Initially, the line's throughput is expected to be about 100,000 barrels a day; however, this can be increased to 300,000 barrels with additional pumping stations. This line will make a greater variety of refined products available, in increased quantities, at a considerably lower transportation cost.

The Laurel Pipe Line represents another first for USS National Line Pipe. Why is USS National consistently chosen for rugged line pipe assignments? The answer in a word: *Performance.* You see, National Line Pipe combines the qualities of strength and dependability to give you a better product. Remember, too, that National Line Pipe is available in a complete range of wall thicknesses, steel analyses and in diameters up to 26 inches in Seamless and up to 36 inches in Electric Weld. For more information, write to National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

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Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
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"Yes, **WECO** Helped Us Cut Costs"

"You know, we really save a lot, using WECO Unions on all our rigs. We rig-up faster and spud-in quicker after moving on location. It also helps cut rig down-time because with WECO Unions we can shift equipment from rig to rig with no time lost in matching unions.

"We can get WECO Unions anywhere, too . . . that sure keeps us from having to tie-up money in spares. Not that we need replacements very often, WECO Unions seem to last forever. And those perfectly matched seats seal under all conditions, too."

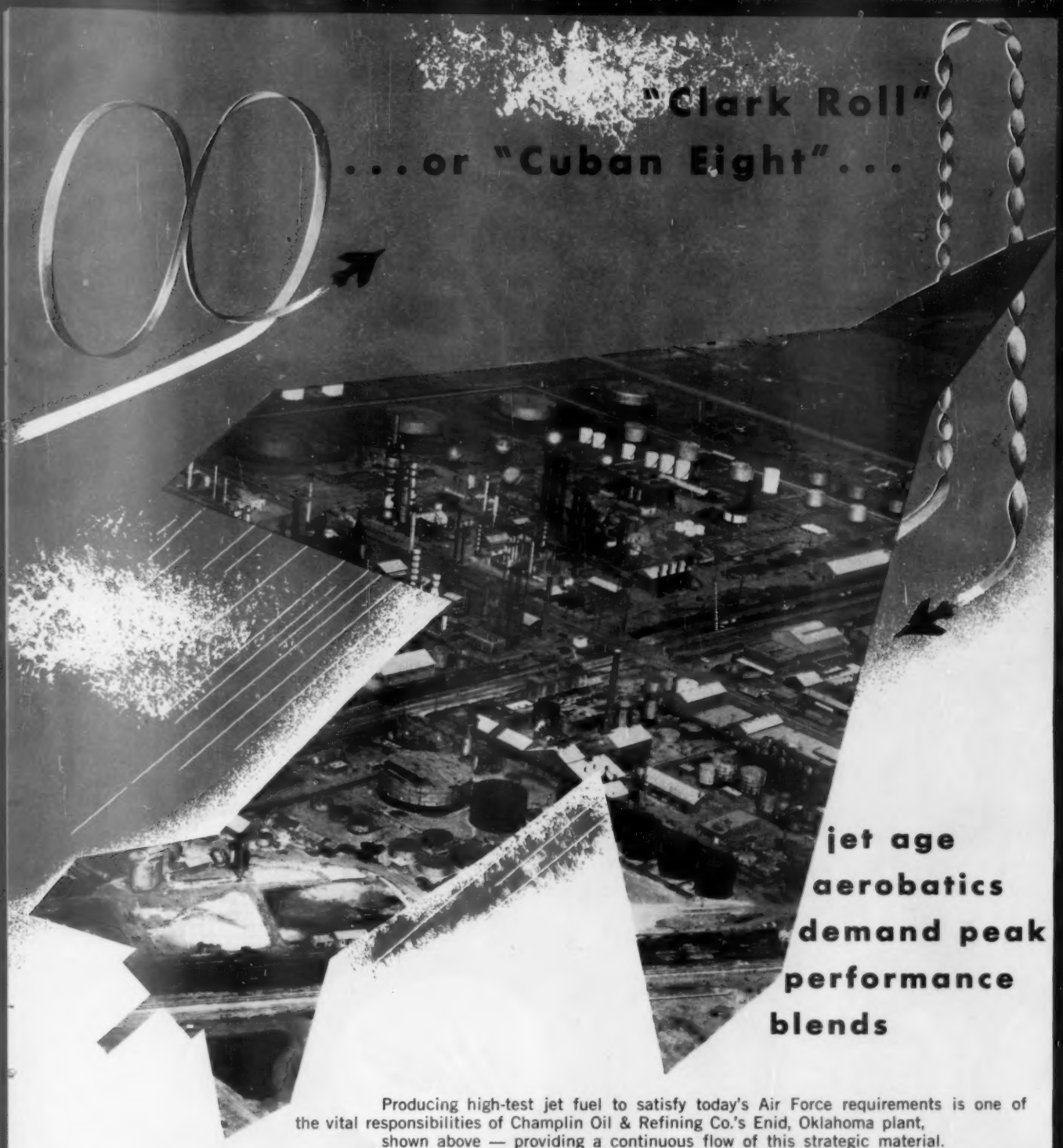
Ask your WECO Representative how you can cut rig costs by standardizing with WECO Unions.

U-7-88

WECO®

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

Division of CHIKSAN COMPANY *a subsidiary of*
FOOD MACHINERY AND CHEMICAL CORPORATION



Producing high-test jet fuel to satisfy today's Air Force requirements is one of the vital responsibilities of Champlin Oil & Refining Co.'s Enid, Oklahoma plant, shown above — providing a continuous flow of this strategic material.

Another important function of the Enid plant is the production of high octane motor fuel, processed to the needs of modern high-compression engines for dependable "over-the-ground" power.

High-octane production at its Enid plant is centered in Champlin's HF alkylation unit, wherein Western Heat Exchangers are a major factor in the production of the alkylate blending component used in the manufacture of this dependable fuel. The HF alkylation unit was designed and built by Badger Manufacturing Company.

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Western Heat Exchangers have become a significant factor in all phases of the process industry. A Western representative is waiting to show you why.

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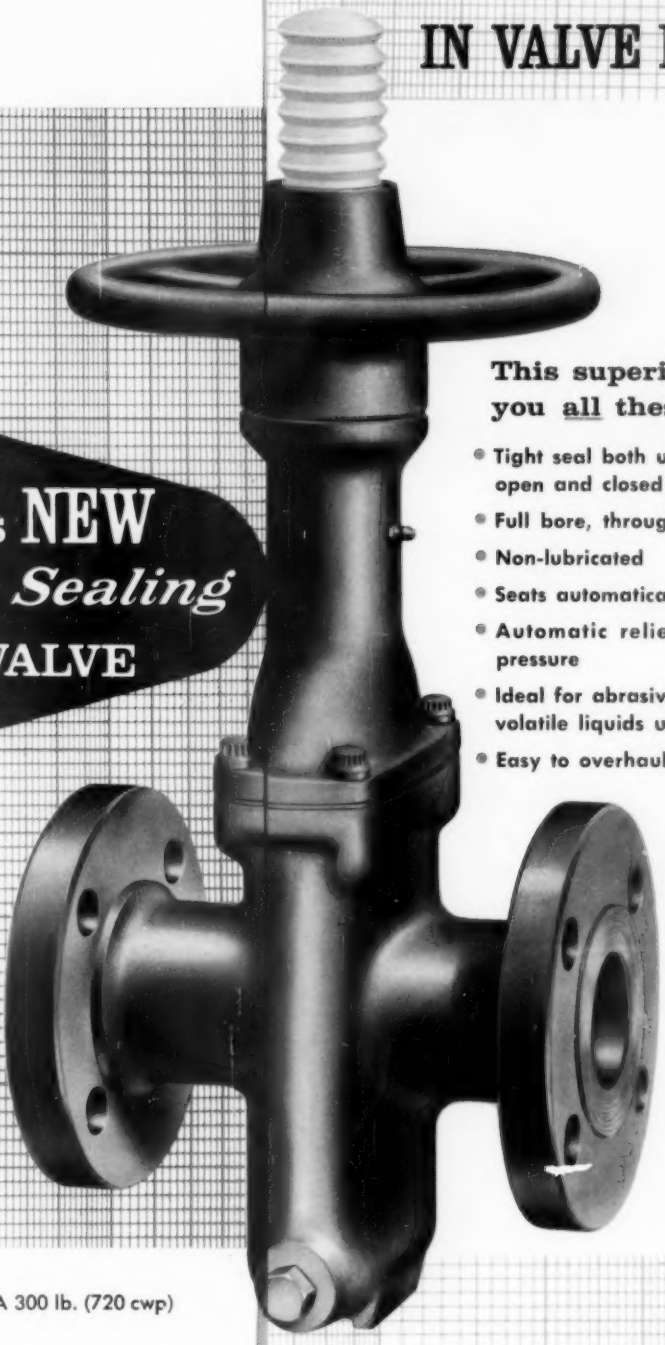
NOW! THE BOLD ADVANCE IN VALVE DESIGN

W-K-M's NEW *Pressure Sealing* GATE VALVE

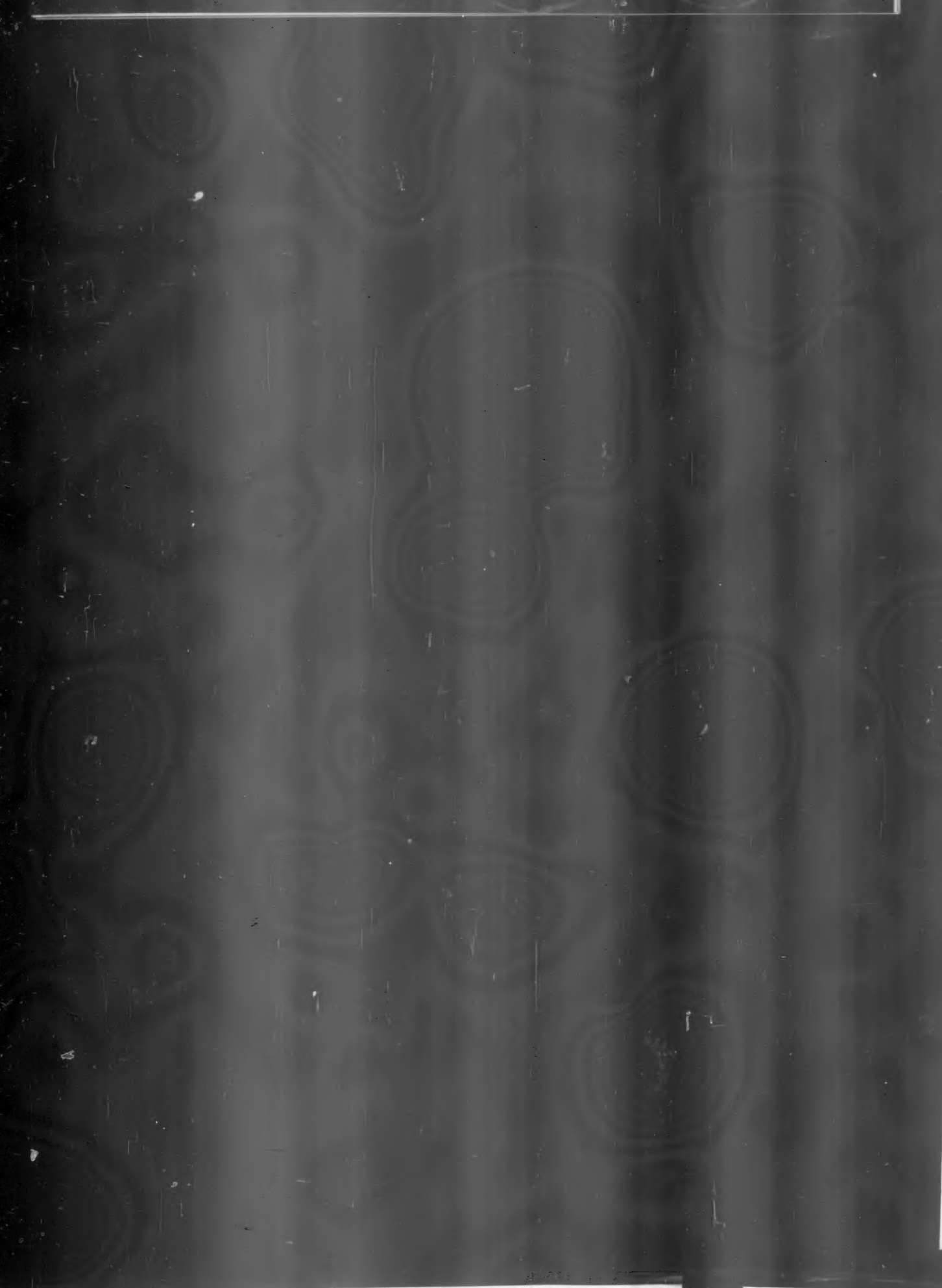


This superior valve gives you all these advantages:

- Tight seal both up and downstream in open and closed position
- Full bore, through-conduit
- Non-lubricated
- Seats automatically adjust for wear
- Automatic relief of excessive body pressure
- Ideal for abrasive ladings, light gases, volatile liquids up to 250° F.
- Easy to overhaul on the line

ASA 150 lb. (275 cwp) and ASA 300 lb. (720 cwp)

ANOTHER OUTSTANDING PRODUCT OF **W-K-M's** *Creative Engineering*



NOW! THE BOLD ADVANCE IN VALVE DESIGN

W-K-M's NEW *Pressure Sealing* GATE VALVE

Tested and Proved in the Toughest Services!

Enthusiastic, completely favorable user reports affirm the superior quality and effortless operation of W-K-M's new Pressure Sealing Gate Valve. "Handles all the sludge in a gas blowout line easily – works better than any valve we've used," states a petroleum engineer. A foreman says, "... easiest operating valve I ever saw ... smoothest working valve made." Similar reports covering many other services are in W-K-M's engineering test data files.

Turn the page to see the design features that make this unique valve so outstanding

ASA 150 lb. (275 cwp) and ASA 300 lb. (720 cwp)

ANOTHER OUTSTANDING PRODUCT OF

W-K-M

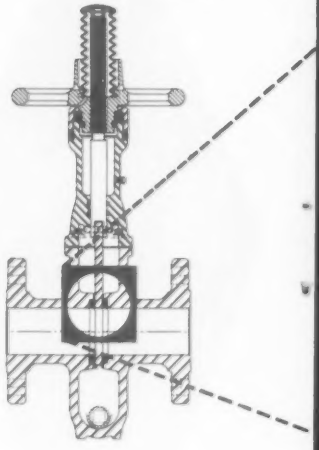
DIVISION OF ACF INDUSTRIES INCORPORATED

P. O. BOX 2117, HOUSTON, TEXAS

Floating

Combination indicator and stem protector. A neoprene rubber bellows compounded to a bright yellow color for long-range visibility—extends above the handwheel when the valve is open; retracts into the handwheel when the valve is closed. It also protects the stem threads from dirt and corrosion.

The stem is heat-treated, hardened stainless steel, with double lead Acme threads for fast operation.



Anti-friction bearings support the operation of the stem nut and handwheel. This feature contributes to easier operation and longer, trouble-free life.

A grease fitting is provided in the bonnet to allow lubrication of the stem threads and bearings.

"O" rings are used for stem packing. They provide an ideal seal and eliminate repacking procedure required with conventional valves.

The bonnet-body connection is a rigid bolted construction with a rubber primary seal and metal-to-metal secondary seal. This seal eliminates the high bolt loads required by conventional bolted connections.

The gate is made of steel, hard-chrome-plated for protection against wear and corrosion.

The floating seats are unique in design. Each seat consists of two kinds of rubber, formulated to W-K-M's specifications, molded to a hardened steel insert. There is a full bore opening, the same diameter as the port, through the insert.

Soft rubber, for sealing, is on the back side of each seat. Tougher, abrasive-resistant rubber, to resist wear, is on the front or gate side. The steel insert is ringed with holes. Pressure forces the soft rubber through these holes, reinforcing the tough rubber and compensating for any wear.

The body and bonnet are steel.

The port is round, the same diameter as the I. D. of the pipe.

Through-conduit construction permits maximum flow, minimum turbulence and pressure drop.

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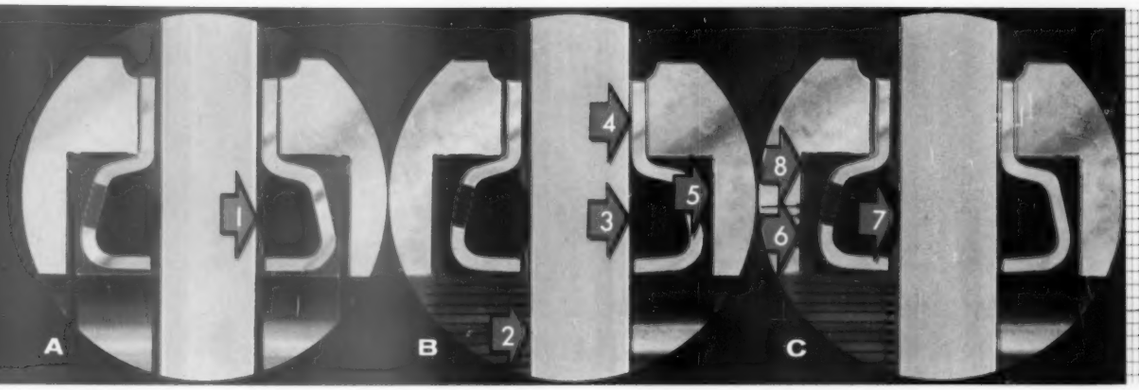
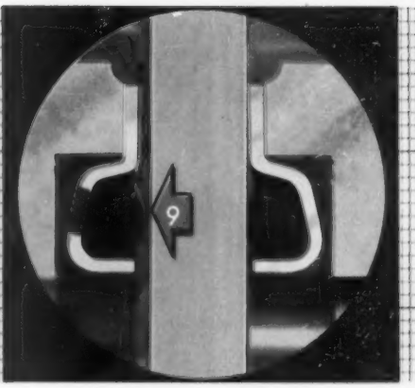
Seats Give Perfect Seal





Line Pressure Seals the Seats!

Illustration A shows the gate in the closed position as it forms a primary seal (1) with the raised ring of tough, firm rubber on the face of each seat.

As line pressure (2) is applied to the valve in Illustration B, the gate is forced against the rubber ring on the downstream seat (3) and compresses it until the gate rests against the hardened steel insert (4). This provides a tight seal between the gate and the rubber on the face of the seat, and a secondary metal-to-metal seal. The action also forces the soft rubber on the back of the seat tightly into its recess (5) and prevents any downstream flow at this point. This double action provides a bubble-tight downstream seal.

The upstream seal shown in Illustration C is caused by line pressure forcing its way into the seat recess behind the upstream seat (6), thereby moving the seat against the gate (7). This pressure is sufficient to achieve a positive seal between the gate and the ring of tough rubber on the face of the seat. At the same time, the raised rim of soft rubber on the back of the seat forms a tight seal with the seat recess (8).

These double-action floating seats provide tight, positive seals—both upstream and downstream.

W-K-M's NEW *Pressure Sealing* GATE VALVE

Two-Way Valve

W-K-M's Pressure Sealing Gate Valve is a two-way valve. It may be installed with the pressure on either side. This valve is especially well suited for block and bleed service since it seals positively both upstream and downstream. The body may be bled of pressure with the gate in either the fully open or fully closed position.

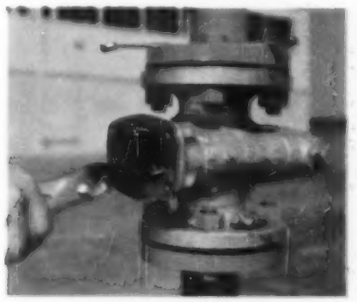
Full Bore, Through-conduit

The full bore, through-conduit gate construction provides a perfectly smooth bore through the valve, eliminating pockets or cavities in which foreign matter might accumulate. Result: perfectly smooth flow with no more turbulence or pressure drop than through an equal length of pipe.

IMPORTANT SAFETY FEATURE:

Automatic Relief of Excessive Body Pressure

This valve has been designed to automatically relieve excessive body pressure caused by thermal expansion. The excess pressure forces the upstream seat away from the gate (9), allowing it to bleed into the line.



Change Seats in Minutes

...on the Line!

Construction of the valve is so strong and materials are so durable that users so far have found maintenance unnecessary. But in time every material wears, and some maintenance is required.

When that time comes you can change the seats in W-K-M's Pressure Sealing Gate Valve (2" through 12") in 15 to 30 minutes *on the line*. The only tools needed are a wrench to loosen the body bolts, and a pair of pliers.

ONE OF THE MOST VERSATILE VALVES EVER PRODUCED

Natural Gas Transmission

Crude Oil

Butane/Propane

Natural Gas Distribution

Proved in the Field!

This new valve is extremely versatile. It's designed for pressures up to 720 psi (cwp) and temperatures up to 250° F. Here are only a few of the services in which it will perform efficiently and economically.

- Gasoline
- Abrasive Slurries
- Alkaline Solutions
- Solvents
- Nitric Acid
- Sulphuric Acid
- Methyl, Ethyl, Butyl, Propyl Alcohols
- Ethylene Glycol
- Butyl Stearate
- Kerosene
- Naphtha
- Stoddard's Solvent
- Carbon Tetrachloride
- Water
- Air

SPECIFICATIONS

Valve Size	2"		3"		4"		6"		8"		10"		12" *	
ASA Rating (lbs.)	150	300	150	300	150	300	150	300	150	300	150	300	150	300
Screw End	X	X	X											
Weld End	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Weld by Flange	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Flanged End	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Gear Operated							X	X	X	X	X	X	X	X

*14" and larger available on request

AVAILABLE NOW at competitive prices from your supplier.

For complete information about W-K-M's new Pressure Sealing Gate Valve . . .

WRITE FOR CATALOG 1200

W-K-M Division of ACF Industries, Incorporated P. O. Box 2117 Houston 1, Texas

W-K-M SERVING INDUSTRY 40 YEARS

5401

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Engineering Progress Report
FROM UNION CARBIDE CHEMICALS COMPANY

Side Stream Distillation Reduces Cost of Gas Sweetening Operations

Control monoethanolamine contamination by eliminating foreign materials

Monoethanolamine reacts with weak acids such as hydrogen sulfide and carbonic acid at ambient temperatures to form salts. Then, these salts decompose when heated to the boiling point of water, liberating the acidic gases and freeing the monoethanolamine for recirculation to pick up more acid gas. This provides an economic cyclic process for absorbing these undesirable materials from a gas stream. Because of this, practically all gas sweetening in the United States is accomplished by means of the ethanolamines. Union Carbide Chemicals Company's Technical Service Department is continually engaged in research designed to give better engineering service to users of CARBIDE's ethanolamines.

MOST UNITS ARE TROUBLE-FREE

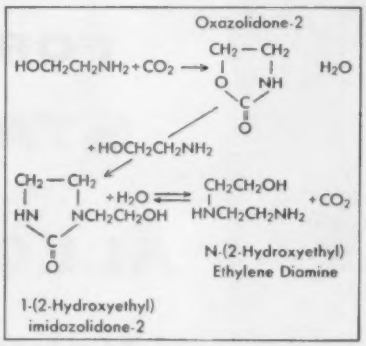
Most of these plants have operated for years without difficulty. However, experience with both aqueous-amine and glycol-amine solutions shows that in some plants the solution gradually loses capacity to absorb acidic gases and may become corrosive.

Research has shown that monoethanolamine contamination can be controlled by a simple side stream distillation system which removes foreign materials and amine degradation products. Thus, sewering can be avoided.

FORMATION OF AMINE DERIVATIVES

Examination of used aqueous and glycol-amine solutions led to the isolation and identification of two monoethanolamine conversion products, namely, 1-(2-hydroxyethyl) imidazolidone-2 and N-(2-hydroxyethyl) ethylene diamine.

It was found that this reaction actually takes place at a very slow rate in some plants handling carbon dioxide. A similar reaction



yielding similar products does not occur when only hydrogen sulfide is present.

EFFECT OF AMINE DERIVATIVES

Formation of imidazolidone reduces the effective monoethanolamine concentration and increases solution viscosity. High concentration may aggravate precipitation of residues in equipment. N-(2-hydroxyethyl) ethylene diamine will pick up acid gases, but release them only with difficulty. The acid gas salt of this stronger amine may contribute to plant equipment corrosion.

DEGRADATION PRODUCTS REMOVED BY SIDE STREAM DISTILLATION

Commercial experience proves that it is possible to remove the imidazolidone from fouled plant solutions by side stream distillation at atmospheric pressure. Batchwise operation handling approximately 1 per cent of the circulated solution has been successful. Vacuum distillation equipment has been equally successful in the case of glycol-amine solutions.

While the substituted ethylene diamine can be efficiently removed in aqueous monoethanolamine systems, it can not be removed from diethylene glycol-monoethanolamine mixtures as its boiling point is within a few degrees of that of diethylene glycol.

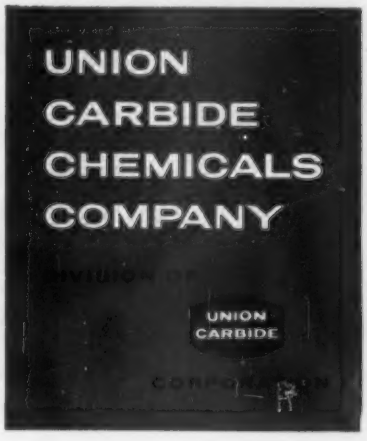
However, the imidazolidone and diamine are in equilibrium. Therefore, reduction of the imidazolidone concentration causes the diamine to revert to imidazolidone. This results in an ultimate removal of both the imidazolidone and the diamine.

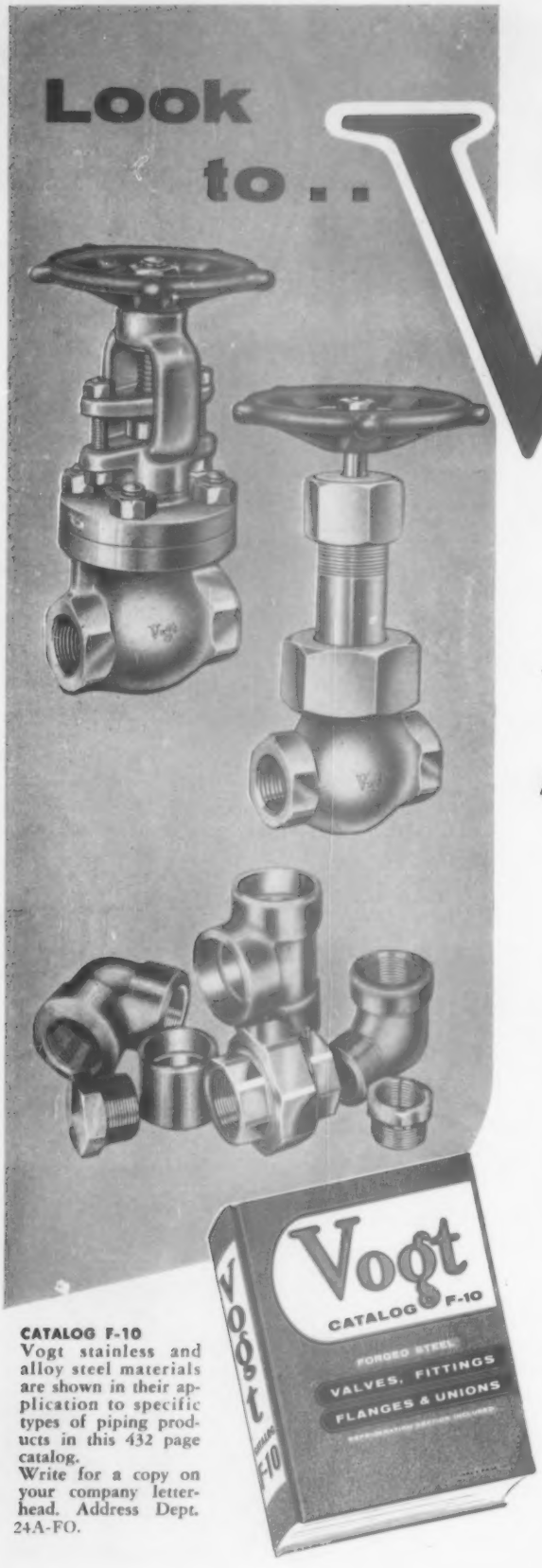
In addition, side stream distillation also removes inorganic salts, organic materials with boiling points higher than monoethanolamine, and heat stable monoethanolamine-acid reaction products.

TECHNICAL SERVICE AVAILABLE

CARBIDE offers many technical services to the gas conditioning industry. If you have a gas treating problem, call the nearest CARBIDE technical representative or write Union Carbide Chemicals Company, Department B, 30 East 42nd Street, New York 17, New York.

"Union Carbide" is a registered trade-mark of Union Carbide Corporation





CATALOG F-10
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all purpose power line

(20 TO 1650 H.P. IN ONLY 3 CYLINDER SIZES)

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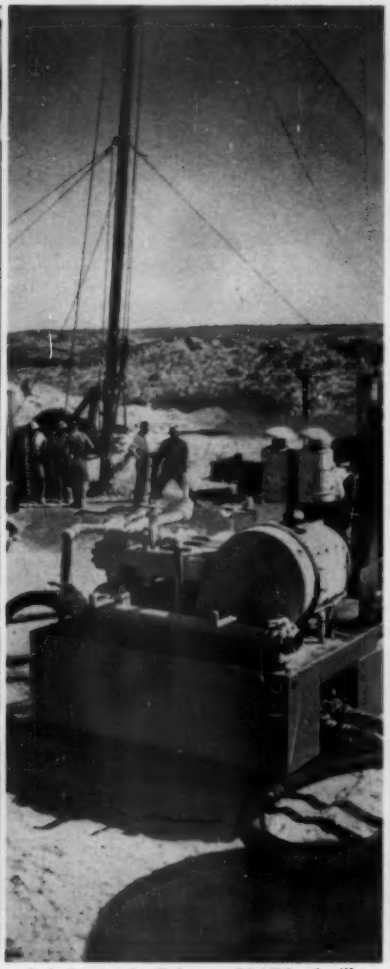
GM Diesel engines are offered in more than 1800 applications of power equipment by over 250 leading manufacturers—wider availability than any other Diesel.



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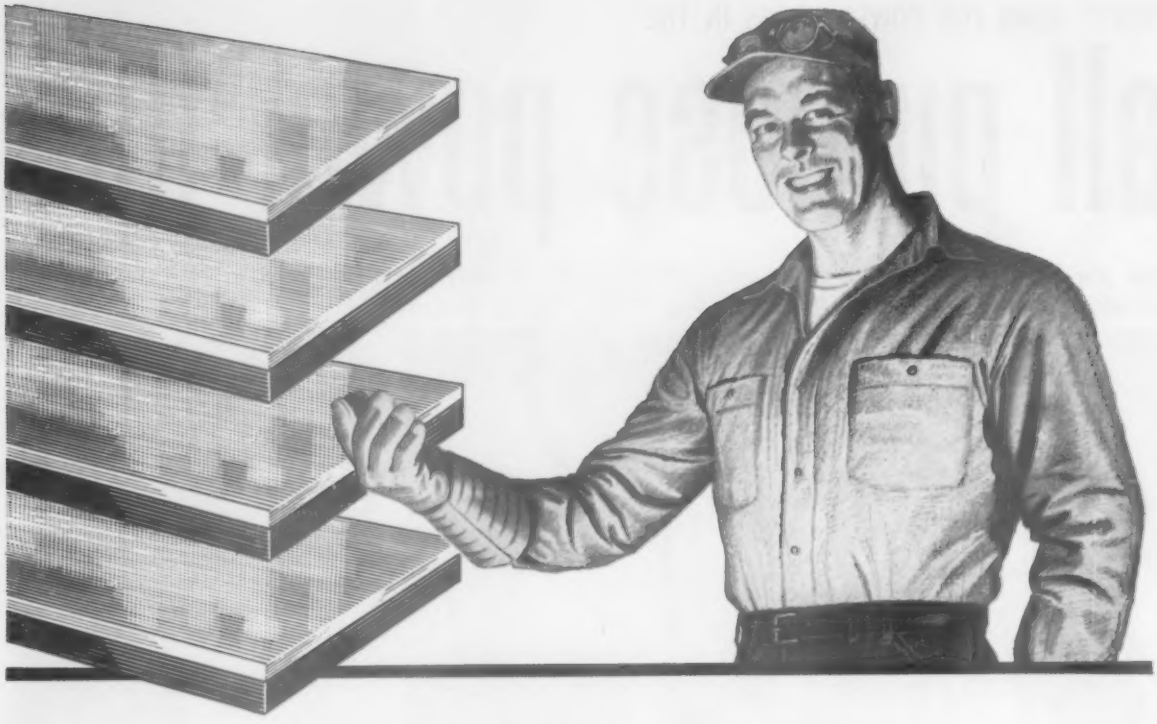

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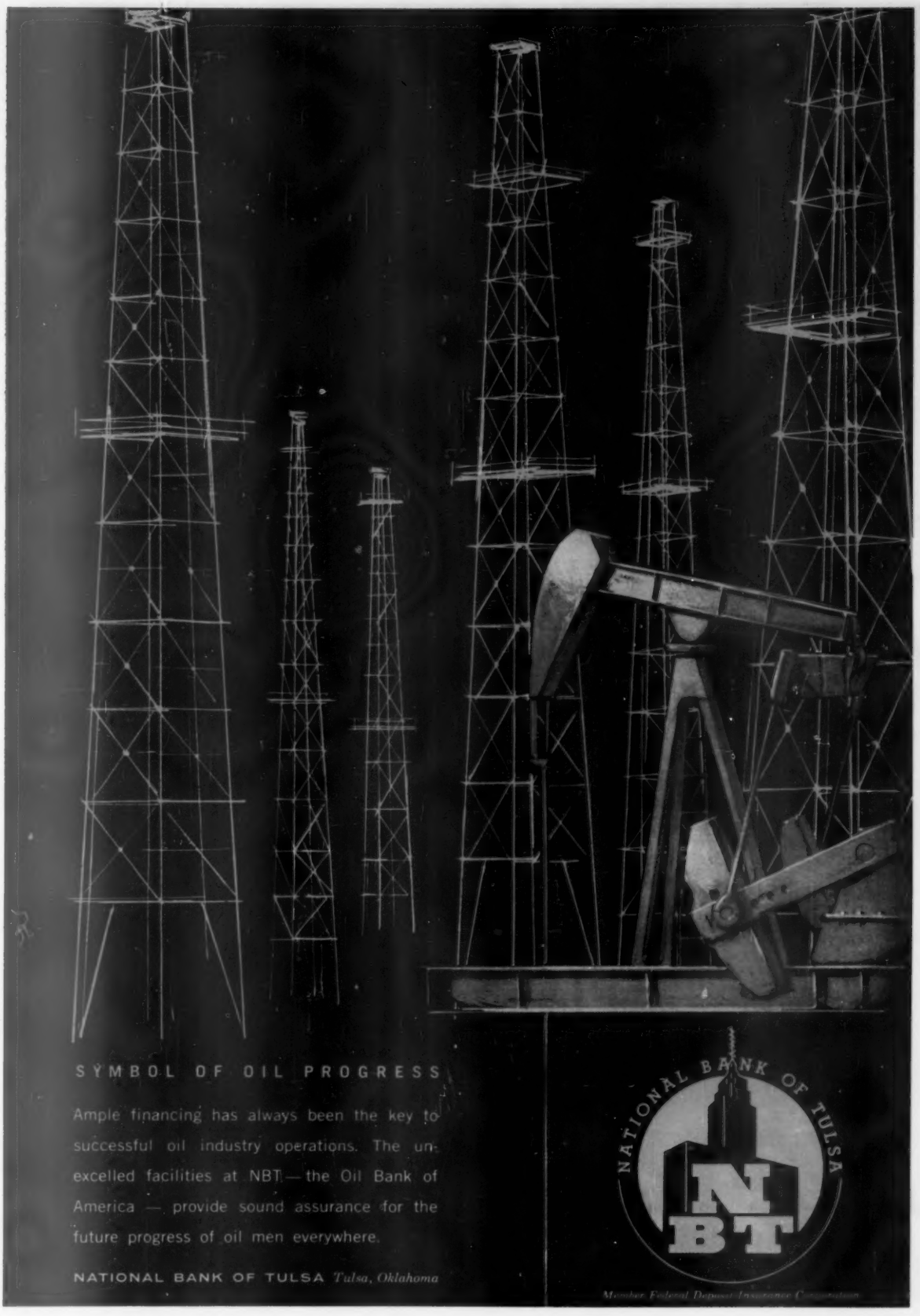
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Ample financing has always been the key to successful oil industry operations. The unexcelled facilities at NBT — the Oil Bank of America — provide sound assurance for the future progress of oil men everywhere.
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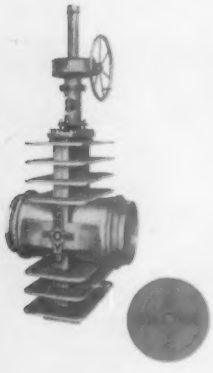
THERE IS A DIFFERENCE IN VENTURI VALVES



The difference is Grove's compact body design. It permits a long, gradual taper of venturi valve hubs that gives you better flow characteristics than any other reduced opening valve. Ordinary valves have thicker bodies and a sharper taper of venturi hubs, causing increased line turbulence and resulting pressure loss.

Even with a port reduction of two to four basic pipe sizes, Grove Seal-O-Ring Venturi Valves have comparable flow capacity and pressure loss to so-called "full ported" rectangular port plug valves. And, they cost less too.

Before you buy any other valve, ask your local Grove man to give you the complete story on these fine valves.

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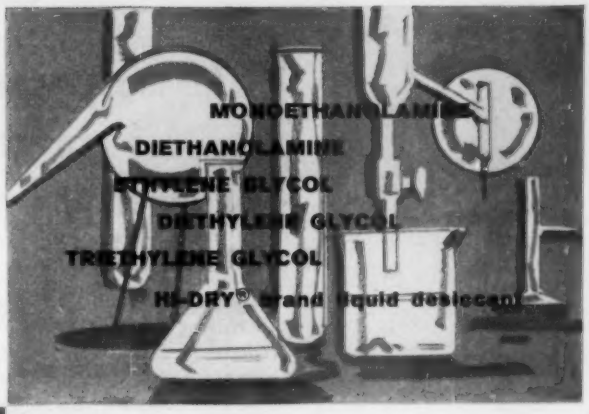

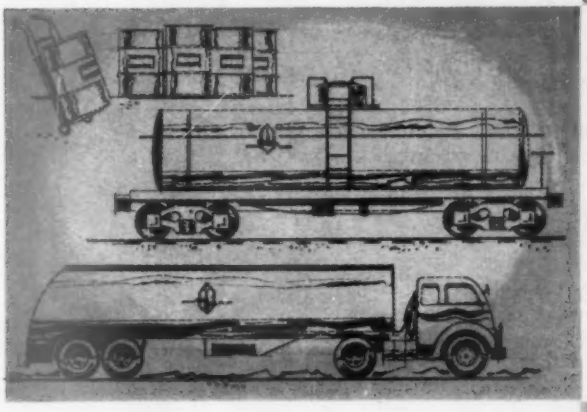

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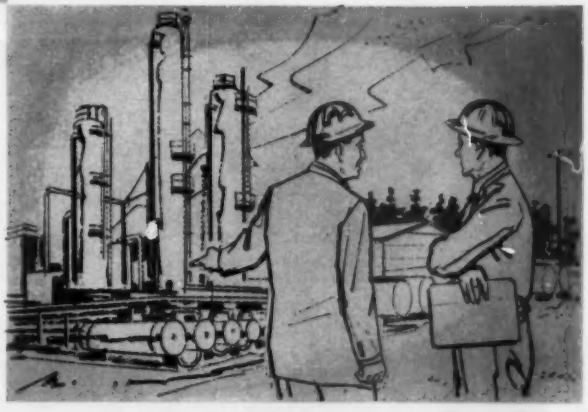
like those relating to proper storage and handling, or complete analyses of your gas-scrubbing agents, or just any way the Jefferson people can help you lick a problem. Your request to 1121 Walker Avenue, Houston 2, Texas, will bring helpful answers on the double.



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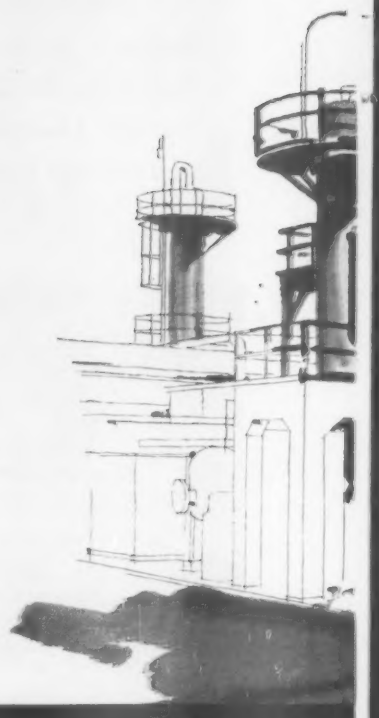
BUTAMER*

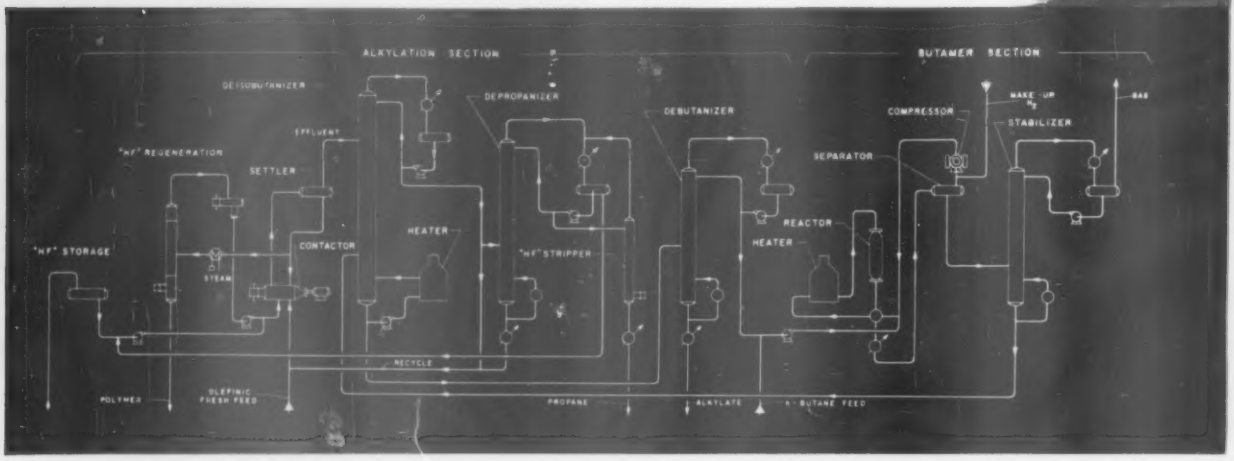
The most practical method for producing alkylate: Butamer and HF Alkylation in combination as a single unit

Increasing use of alkylate for blending into motor fuels makes these two up-to-the-minute processes highly important to petroleum refiners. Butamer is a new process for producing isobutane . . . "HF" Alkylation is an efficient, economical process which combines isobutane with olefins to produce alkylate, much in demand today as a motor fuel component.

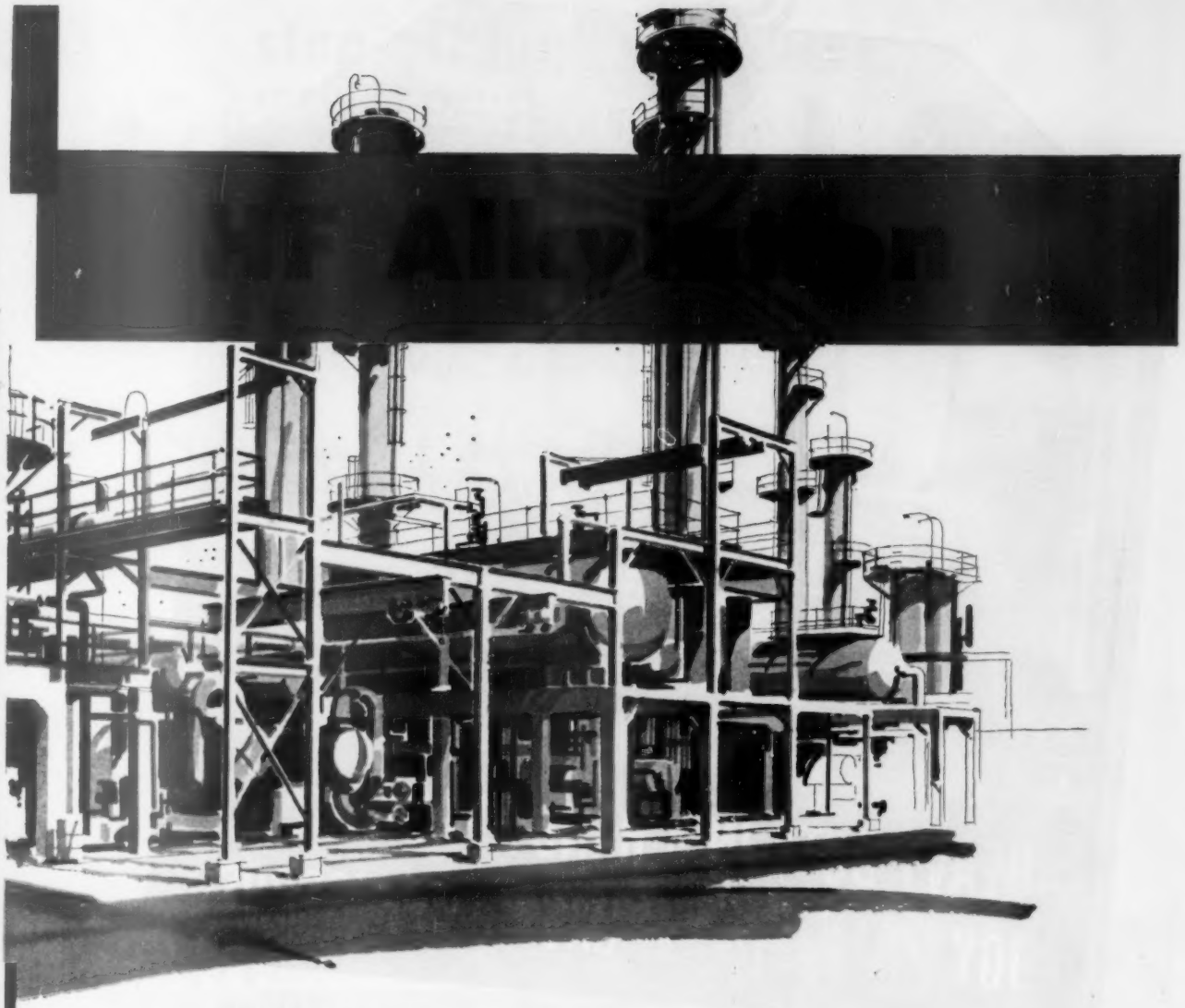
With the advent of high compression ratio engines, usually starting at 9.5:1, motor fuel, especially those deficient in isoparaffins, have been associated with an unusual engine noise called "rumble." Further study reveals this rumble can be eliminated through the use of a better balanced fuel, namely using a fuel composed of a greater volume percentage of isoparaffins. Alkylation produces a high octane isoparaffin that also has good sensitivity, ignition point and combustion characteristics.

*Trademark





More Than Forty Years Of Leadership In Petroleum Refining Technology



Butamer—Heart of this process is a noncorrosive, stable and rugged platinum-containing catalyst especially developed by UOP. Capable of operating at relatively low temperatures, its use assures a sufficiently high concentration of isobutane in the reactor effluent to eliminate excessive recycle of normal butane.

Operating under hydrogen pressure, with low hydrogen-to-charge ratio, the high catalyst activity results in economical liquid hourly space velocities, thus requiring only a modest catalyst inventory. The mild operating conditions further assure minimum loss to by-products.

HF Alkylation—"HF" Alkylation is a catalytic process which combines olefins such as propylene, butylenes, and amylenes with isoparaffins (usually isobutane) to form a mixture of branched chain hydrocarbons of higher molecular weight known as alkylate for aviation and motor fuel.

These two processes are readily and economically integrated. Together, they form the ideal, most practical method for producing alkylate.

Write for detailed information. Ask also about other UOP refining and petrochemical processes, available to refiners everywhere, for improving operating efficiency and producing better and more profitable petroleum products.

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UNIVERSAL OIL PRODUCTS COMPANY

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Two Joy WB-14 compressors boosting residue gas from field processing. Cylinders 4¾ x 7; suction pressure 420 psig; discharge pressure 450 psig; capacity 13.5 mmcfd.

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JOY PACKAGED GAS COMPRESSORS

for gas boosting—repressuring—gas lifting

Joy gas compressors are built on a single skid, ready for over the road hauling. They arrive at your site, assembled and completely self-contained, ready for hook-up.

The semi-radial design of the compressor makes it extremely compact, yet all parts are readily accessible. This compactness, light weight, and package assembly results in economy five ways: in purchase, in moving, in installation, in maintenance, and in operation.

If your requirements should change, it is easy to change volume or pressure because any Joy cylinder fits any Joy frame. For maximum capacity in a powerful package choose a Joy gas compressor. Units available from 50 to 400 hp. See these fabricator-distributors for Joy gas compressors.

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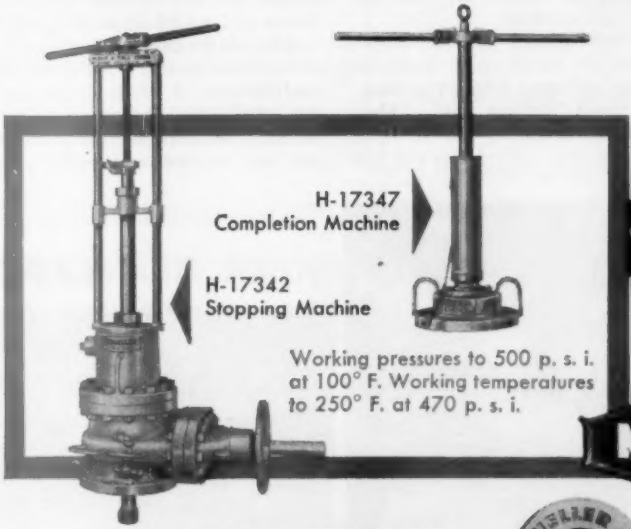
Now—Mueller Co. has developed a line stopper unit to give quick, effective, economical stop-offs of 4", 6" and 8" lines *under pressures up to 500 p. s. i.*

Unit No. 3SW-500 includes the necessary machines and equipment to make two-stop-offs at once. Convenient, built-in by-pass connection makes it easy to set up a temporary by-pass line to maintain flow in the line. Relocations, tie-ins and repairs can then be made in complete safety.

These design features are typical of the attention to detail in research, design and engineering that becomes a part of every Mueller product.



Working pressures to 500 p. s. i. at 100° F. Working temperatures to 250° F. at 470 p. s. i.

Making a stop-off on a 6" line with a Mueller H-17342 Stopping Machine.

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DOW | **CHEMICAL NEWS** *spurs petroleum's progress*

Many of the milestones in the century of progress for the oil and gas industry have been marked in chemical laboratories. There, chemists have developed a whole "string of tools" to help oil and gas companies produce purer, more useful products at lower cost. This series of news notes will keep you posted on the latest chemical "strikes" that will prove profitable to you.

You may wish to check certain items in this advertisement and forward to those concerned in your company.

Route to:

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DOW LEG WORK, LAB WORK SPELL PROFIT FOR ETHANOLAMINES USERS

"Clinical" approach to gas conditioning problems pays off for processors. "On the spot" technical help often turns troublesome down-time into handsome dividend checks for stockholders. And Dow's Midland, Texas, terminal provides quickly accessible supplies of important chemicals such as amines and glycols to combat the trickiest sweetening and dehydrating problems.

Ever see a case history on a gas conditioning problem? A look in the files of the Midland, Michigan, Gas Conditioning Laboratory of The Dow Chemical Company would show you how one gas company after another has had its conditioning problems diagnosed and solved by this thoroughgoing clinical method.

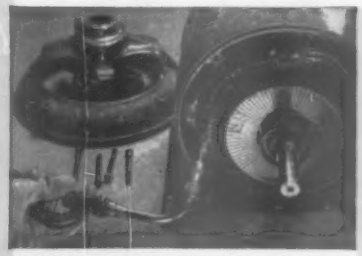
"This case history file has helped make real gas conditioning specialists out of our technical field servicemen," a department chemist said. "These men know these files as well as we do and when they're called into the field on a problem they're posted on latest findings—right up to the minute they step on the plane."

Typical case histories that have been marked "solved" at the Midland lab are: corrosion in amine units; high temperature corrosion; glycol contamination; salt contamination; high glycol losses and solidification of paraffin.

One such company to benefit from this clinical service is the Grace Chemical Division of W. R. Grace and Co., for which Dow has provided a continuing consulting service on the analysis of monoethanolamine solutions

Dow's Gas Conditioning Laboratory (shown analyzing a sample of Grace Chemical's monoethanolamine solution used in gas scrubbing) offers a similar "consulting" service for many oil companies.

EXPLORE



CHLOROTHENE

Safer, new solvent gives high cleaning power, reduces fire hazard to minimum. Investigate Chlorothene® (Dow 1,1,1-trichloroethane, inhibited) for cleaning.

used in their gas scrubbing service.

The Gas Conditioning Laboratory at Dow has provided the Grace Chemical Division with information on corrosion and foam characteristics of their monoethanolamine solutions; a report of the contaminants removed from their amine filter; and methods for determining organic contaminant found in used amine solutions—complete with infrared patterns and standards to use in setting up the analysis in Grace's own laboratories.

Dow's laboratory-based technical service people can give other companies in the gas industry faster answers because they always have the latest lab results right in the brief case.

Users of Dow glycols and amines for gas sweetening and dehydrating profit time and again from this "free clinic" service of the Gas Conditioning Laboratory. And they profit, too, by having a source for these vital products right in their own backyard. The chemical terminal at Midland, Texas, provides rapid, direct-to-user delivery of high quality di- and triethylene glycols and mono-, di- and triethanolamines.

Gas men who would like to investigate the Dow technical service approach to gas conditioning problems should consult Dow.

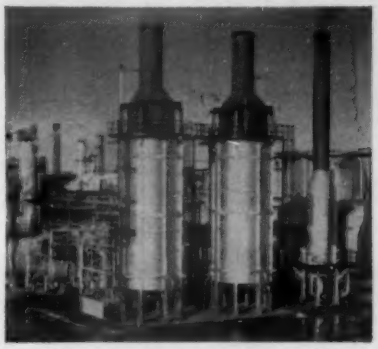
DOWTHERM:

Uniform heat-transfer = uniform oil products

When Imperial Oil, Limited, of Canada planned an oil processing sequence for their new lube oil refinery at Edmonton, Alberta, the problem of heat-transfer came up.

To be sure each can of oil that came from the refinery poured alike, looked alike, performed alike . . . and even smelled alike . . . engineers knew they needed a heat-transfer medium that "kept its head" at high temperatures.

They settled on Dowtherm® primarily to obtain positive high temperature control. (In vapor systems, Dowtherm transfers heat up to the temperature of 750°F. . . . with fraction-of-a-degree accuracy . . . at pressures below 150 p.s.i.!) In operation, however, they found Dowtherm had additional economic and practical advantages over less desirable heat-transfer media such as hot water, direct fire or steam.



New lube oil refinery of Imperial Oil, Limited, at Edmonton, Alberta.

For complete information on how this organic heat-transfer medium "handles with care" processes requiring high temperature heat-transfer, write The Dow Chemical Company.

CAUSTIC SODA:

New Plaquemine plant makes five for Dow

Five is a lucky number for petroleum processors in the Gulf area. That was the number given to the new Dow Plaquemine, La., caustic soda plant when it went on stream.

These producing plants, coupled with eight storage and shipping terminals, give Dow the most extensive caustic supply network in the country. These supply points provide petroleum industry users throughout the nation with all the high quality caustic they need . . . *when* they need it.

Because caustic soda is essential in virtually every operation of petroleum refining, more and more refineries are coming to depend on Dow as their most reliable source of supply. Convincing evidence of the reasons for this is contained in the *Dow Caustic Soda Handbook*, immediately available.

★ ★ ★ ★

For more information on these and other chemicals important to the oil and gas industry, contact the Dow sales office nearest you or write THE DOW CHEMICAL COMPANY, Midland, Michigan, Chemicals Sales Department 783U7-6.

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basic to the petroleum industry

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Solvents • Ammonia • Phenol • Calcium Chloride • Germicides

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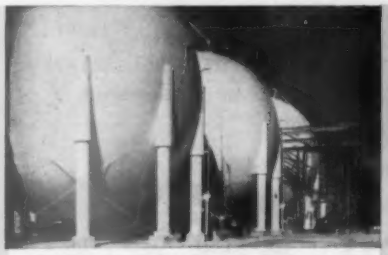
THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

DOW

THESE OTHER PROFIT POSSIBILITIES



AMMONIA

Dow provides fast, dependable delivery of high quality anhydrous ammonia, vital for refining operations and the prevention of corrosion in processing equipment.

SODA ASH

Authoritative, 45-page Soda Ash Book describes properties, uses, and reactions of this important chemical. Order your copy from Dow today.

DOWELL

Dowell, Dow's Oklahoma-based division, provides the petroleum industry with ready supplies of high-quality muriatic acid, well trained technical specialists.

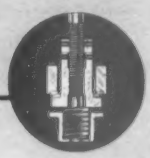
Big Drawworks with Small Rig Simplicity

Rated at 900 to 1400 net input horsepower, the Mid-Continent U-914-C Drawworks offers the drilling industry all the desirable features of a large rig, while retaining the flexibility and simplicity of operation of smaller units. The U-914-C is designed as a single package unit containing hoisting drum, transmission, rotary drive, and auxiliary brake on a single skid. Rugged in construction and smooth in operation, this unit provides dependable, economical and trouble-free service to meet present day drilling practices. For complete information, contact your local Mid-Continent representative.

DWK-8

SELF-EQUALIZING 52" x 10" BRAKES

Double adjustment, individually equalized bands have spring loaded spherical dead-end equalizer seats which eliminate bending of the dead-end pins.



EXTRA LARGE BALANCED DRUM FAWICK VC CLUTCHES

A 29" diameter by 53¼" long drum provides three wrap spooling when hoisting 90-foot stands with a 10 line reaving system using 1¼" wire line and LeBus grooving. Hi- and lo-drum clutches are identical 38VC1200 Fawick Ventorque. A splined clutch is provided on the lo-drum side for emergency use.

ALL BEARINGS GREASE LUBRICATED UNITIZED CONTROLS

MID-CONTINENT SUPPLY CO.

MID-CONTINENT BUILDING • FORT WORTH, TEXAS

Export Division: 45 Rockefeller Plaza, New York 20, N. Y. Cable: MIDCUMPORT NYK

A KENNAVIS INDUSTRY

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

Need a REALLY BIG selection of bolts?

First step is to pick a really big boltmaker. Sheffield's Bolt and Forged Products Department is one of the world's largest integrated bolt plants. That means wide selection. Big productive capacity. Fast service.

You get immediate shipment on thousands of different standard and special bolts. In any quantity. Or if you need bolts "custom made" to specifications, we'll do the job in record time.

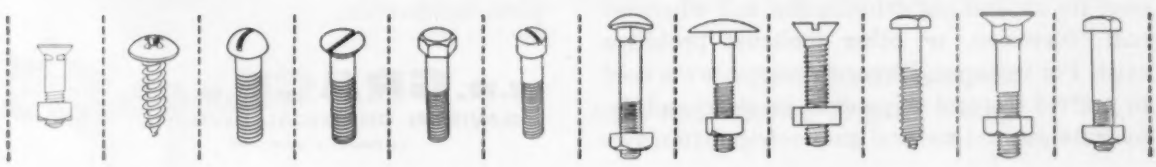
Another thing you can be sure of: every Sheffield bolt is quality controlled from furnace to finished product. Whatever your bolt need, however urgent, just call your Sheffield Man.

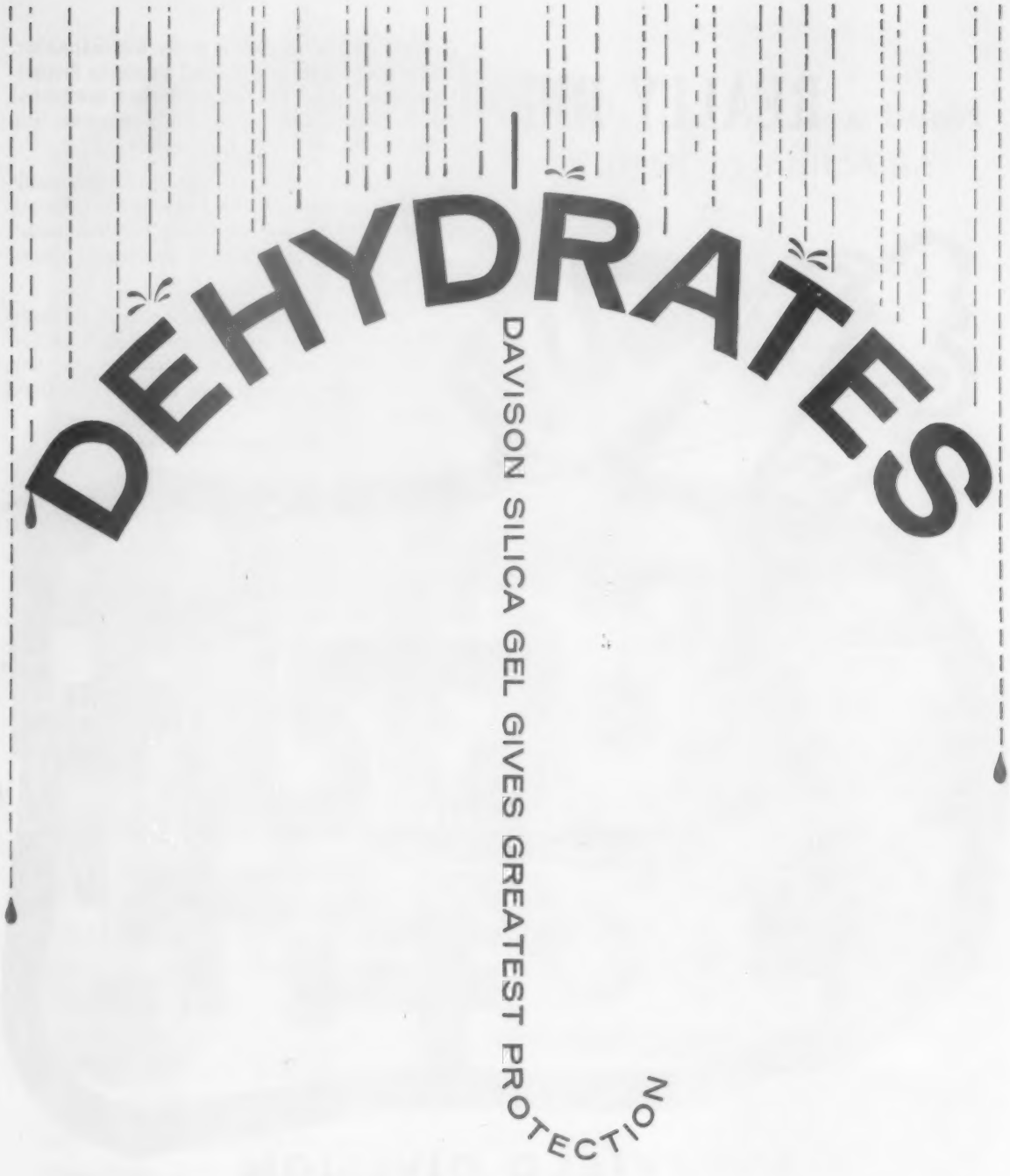
Bolt Makers Since 1888

SHEFFIELD DIVISION

ARMCO STEEL CORPORATION

OTHER DIVISIONS AND SUBSIDIARIES: Armco Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products





One cubic inch of Davison Silica Gel has an adsorptive surface of 90,000 square feet—an area larger than two city blocks! This capacity has made Davison Silica Gel the favored desiccant for air and gas dehydration and wherever rust, corrosion, or other moisture problems exist. For instance, Davison desiccants are used to protect tropical shipments, to clean and dehydrate air and natural gas—refrigeration systems—blast furnace gases—and in oxygen plants. Perhaps the application of a Davison desiccant to *your* moisture problems is in order. Write Department 3127 or call today for complete information.

W.R. GRACE & CO.
DAVISON CHEMICAL DIVISION
BALTIMORE 3, MARYLAND

Westinghouse Motors are typical of the broad line of quality equipment stocked and distributed through National's 124 stores.

This is the NATIONAL SUPPLY STORE, too!

The next time you stop in a National Supply Store, remember to shop *behind* the counter, too. You'll see quality equipment like these Westinghouse Motors, Larkin Products, Link-Belt Chain, Ajax Engines, Oilmaster Pumps, Tube-Turn Fittings, Rockwell-Nordstrom Valves, Columbian Rope and many more. Wherever you go, National Supply offers you an unmatched variety of quality products.

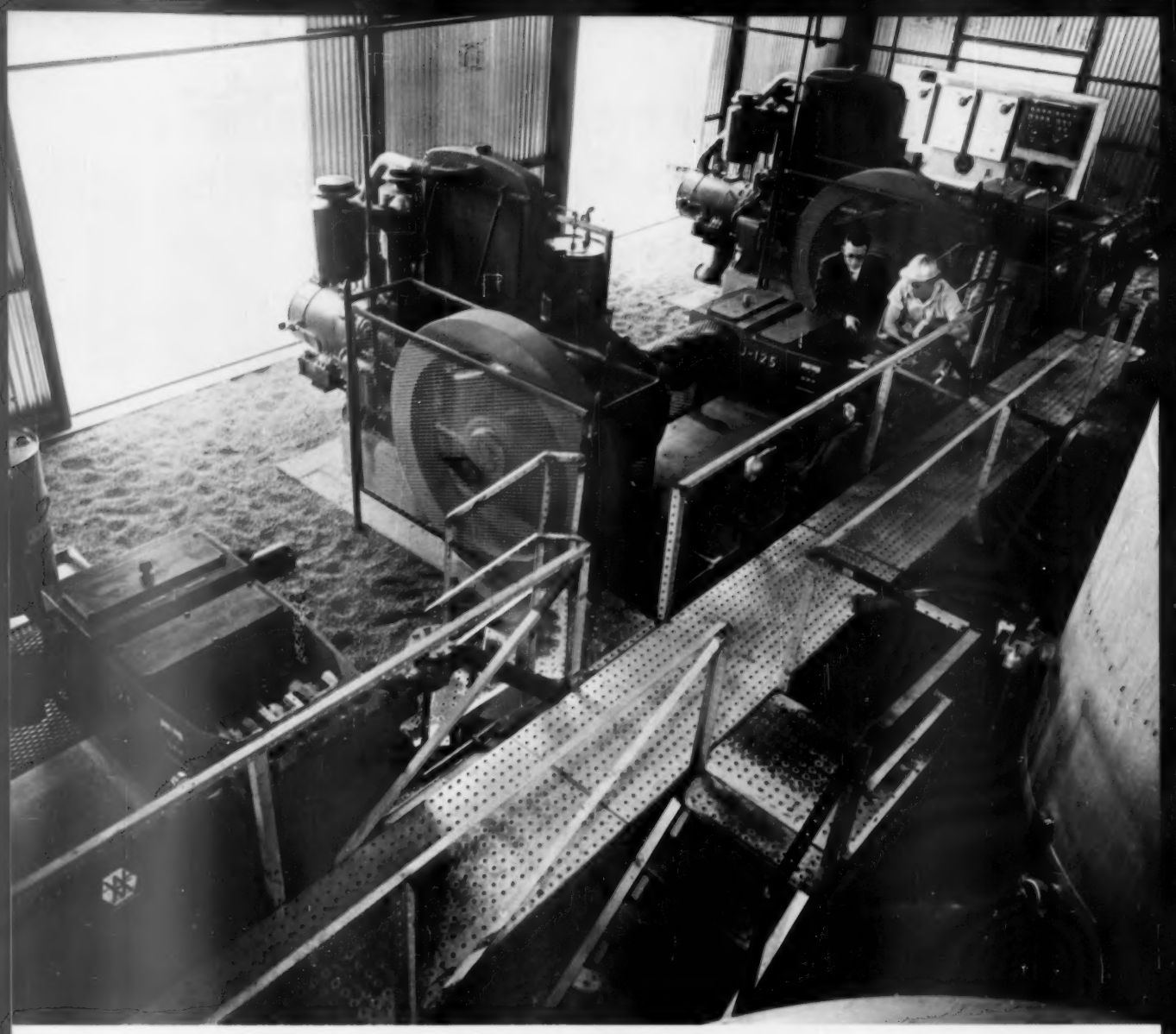
On the next pages:
New NATIONAL Triplex Pump

This National J-125 Pump is operating in a waterflooding installation near Pampa, Texas.

New NATIONAL Triplex Pump for pressures

Has many features for smooth operation,

One of the many outstanding features of the new J-125 Triplex Pump is a built-in diaphragm-type suction dampener. This runs the full length of the cylinder, directly beneath the suction valves to provide optimum dampening effect. The dampener keeps harmful surges from entering the suction piping, promotes better filling, and makes your overall pumping operation smoother and quieter.



This multi-pump station near Denworth, Texas, employs three direct-driven J-125 Pumps in waterflood application.

to 6,000 psi and volumes to 11,000 b/d

low maintenance, long service

Other significant features include:

- Choice of 6 fluid ends
- Double extension crankshaft
- Easy access to plungers, stuffing boxes
- Replaceable intermediate rod
- Controlled valve fit
- Positive splash lubrication
- Longer packing and plunger life

You can easily get more information on the J-125—the smoothest running pump of its type ever produced. Ask the National representative for the new bulletin explaining the construction details and performance charts of this big, rugged pump!

More on next page

Your best buy for every recovery method . . . NATIONAL production equipment!

Two National Type E-24 Pumpers operate through this National dual completion wellhead assembly, located on the discovery well of an Alabama field. National Wellhead Equipment features interchangeable units which provide many combinations for your specific size, capacity and type needs.

National Plunger Lift can be the best production method for certain types of wells. It uses formation gas or injected gas for operation, has low initial and service costs. Equipment is also available for gas well operation to remove liquids and maintain a uniform and increased flow rate of gas.

National Pumpers are available in 13 basic sizes, with more than 90 standard specifications in beam and crank counterweighted types. There's one to suit any pumping need you may have!

Get reliable service from precision-made National Sucker Rods. They have top resistance to fatigue, shock, corrosion and impulse loads. Available in range of grades to meet every well condition.

THE NATIONAL SUPPLY COMPANY

Subsidiary of Armco Steel Corporation

TWO GATEWAY CENTER, PITTSBURGH, PA.

DIVISION OFFICES: Calgary, Dallas, Denver, Houston, Toledo, Torrance, Tulsa

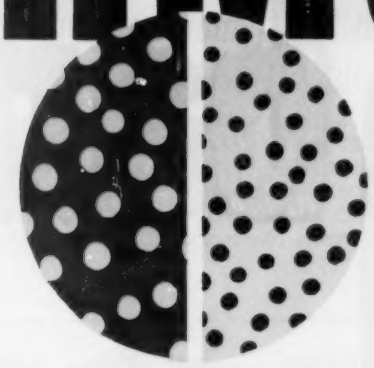
EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; City Wall House, Chiswell Street, London E.C.1

Litho in U. S.

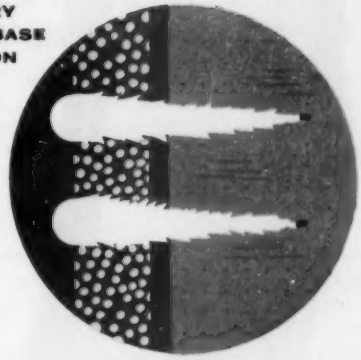
Seeing is believing . . .

INVERMUL*

BAROID'S *basic additive for* **OIL-BASE-** *emulsion drilling muds*



INVERMUL OIL-BASE EMULSION | ORDINARY WATER-BASE EMULSION

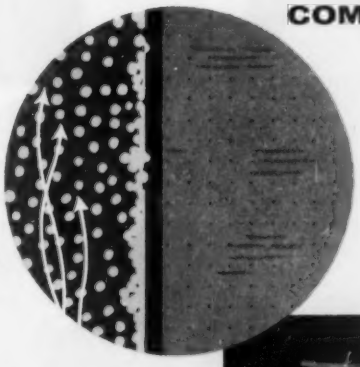


BETTER COMPLETIONS

INVERMUL . . . stabilizes oil-base-emulsion mud prepared with crude or refined oils.

INVERMUL MUD . . . protects formations against water damage.

INVERMUL MUD . . . is easy to maintain or recondition during drilling, coring or working-over.



WATER DAMAGE TO FORMATIONS MINIMIZED

BAROID

BAROID

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MAIN OFFICE: P. O. BOX 1675, HOUSTON 1, TEXAS

*Trademark of Baroid Division National Lead Co.

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top banana!

Men who buy valve face grinding machines have made SIOUX the top banana. More SIOUX VFGM's are in use today than all others combined!

Buy the Best . . . Buy **SIOUX**

ALBERTSON & CO., INC.
SIOUX CITY, IOWA, U. S. A.

CONTINENTAL-EMSCO

BLOCKS and SWIVELS

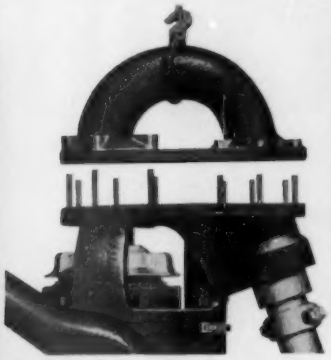
brighten up your profit picture with quick trips.. less trouble.. long life

Right up to the minute streamline design provides the proper balance for Continental-Emsco straight and fast-falling MA and RA series blocks .. low center of gravity design increases working height in the mast .. lets block ride higher in the mast for greater clearance at derrick floor. Reversible cartridge allows lubrication of sheave bearings from either side.

HERE'S WHERE YOU GAIN EXTRA RUNNING MILES FROM WIRE ROPE

Note the flame-hardened surface of the sheave grooves. This keeps their surface smooth and long wearing .. no scored surface to cut and shorten wire line life.

Continental-Emsco L series swivels are made to handle the high mud pressures of today's drilling .. and yet are light enough not to bend the kelly in its rat hole. They are short with ample hook clearance and are simple in design for quick .. easy maintenance.



ROTARY HOSE IS NOT DISTURBED WHEN REPLACING PACKING OR WASH PIPE

This design feature cuts down-time, since rotary hose does not have to be disconnected to change packing or wash pipe .. packing is a one-piece unit which also speeds-up replacement.

For Service that Sings.. Equipment that Hums.. Go..

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Serving the Oil and Gas Industries ... Worldwide

DA 902

CONTINENTAL-EMSCO COMPANY • A Division of The Youngstown Sheet and Tube Company • General Offices: Dallas, Texas
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Representatives in All Principal Oil Fields of the World

1959—100th Anniversary of the Oil Industry... 70th Anniversary of Standard Oil Company

whale oil lamps to space rockets

How the oil industry helped the United States to become the world's most productive nation!

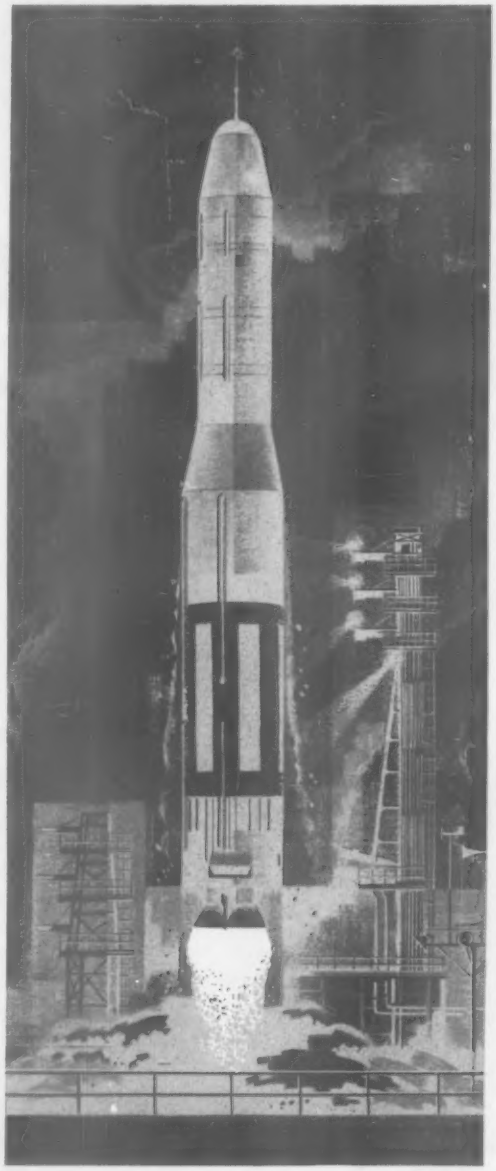
1859 Colonel Drake discovers oil—and the decline of the great whaling industry is in sight as thousands of lamp users turn from whale oil to kerosene.

1889 The automobile is in its infancy—weak and unpromising. Standard Oil Company is born on June 18, 1889. The following year the company's first research laboratory is opened at Whiting, Indiana.

1903 Two bicycle mechanics named Wright fly an odd-looking machine at Kitty Hawk. Almost 33,000 autos are on the road, but the horse is still supreme. Standard Oil is building a new refinery at Sugar Creek, Missouri.

1911 Almost 640,000 motor vehicles are on the road. Dr. William M. Burton and Dr. Robert E. Humphreys, famous Standard Oil scientists, discover the secret of mass producing gasoline economically. The company becomes independent of all other Standard Oil companies.

1923 The automobile is here to stay. More than 15 million motor vehicles are on the highways. Standard is the first major oil company to sell gasoline containing tetraethyl lead, anti-knock agent.



1940 The greatest demand in history for aviation fuel is near. Standard Oil puts into operation the world's first catalytic reformer, which produces higher octane gasoline than was possible before.

1959 The Space Age is dawning. New fuels and lubricants for rockets and jets come from Standard Oil laboratories to help make space exploration possible and to strengthen America's defenses. Standard Oil marks its 70th anniversary.

Here are some important developments by Standard Oil, a leader and a pioneer in petroleum research.

- How to mass produce gasoline economically. This opened the way to modern automotive transportation.
- How to recover more oil from almost-dry wells. This added billions of barrels to America's oil reserves.
- How to eliminate gasoline gumming. This meant lower repair bills for car owners.
- How to dewax motor oils efficiently. This meant better car performance and fewer trips to the repairman.
- How to make clean burning solid fuels for rockets. This was a big step forward in America's missile program.

These, and many other Standard Oil developments, have played an important part in man's progress from the horse-and-buggy age to the Space Age.

STANDARD

STANDARD OIL COMPANY
(INDIANA)

THE SIGN OF PROGRESS... THROUGH RESEARCH

DIRECTIONAL DRILLING • FISHING & CUTTING • ELECTRICAL WELL SERVICES • OILFIELD SUPPLIES • EXPORT TOOLS & SERVICE

HOMCO

Directional Drilling

THE HOMCO COMBINATION JAR AND KEYSEAT REAMER

Stops the trouble before it starts

Homco Directional Drilling is a service designed to give you the most accurate and most economical job possible. The skilled Homco operator working for you knows his job and has the tools to do it right. He is in constant contact with a staff of Directional Drilling experts who guide and check his operations.

One of the tools that the Homco man uses in directional drilling is the Homco Combination Jar and Keyseat Reamer. This tool, designed and manufactured by Homco, primarily for Directional Drilling, prevents many a stuck string. There is no better insurance against stuck drill collars in keyseats than this tool. With reamer blades larger than the O.D. of the collars, when keyseats are formed the tool sticks instead of the collars. When this occurs it is easy to rotate to the right to jar down and out of the keyseat. Then the string is raised, rotated to the right, and the tool reams up through the keyseat.

research
engineering
developing
manufacturing

Sidetracking
Straightening
Surveying

HOMCO

HOUSTON OIL FIELD MATERIAL COMPANY, Inc.

THE WORLD'S LARGEST INDEPENDENT DIVERSIFIED SUPPLY AND SERVICE ORGANIZATION

HOMCO has it!

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Mexico City, Mexico
Long Beach, California
Maracaibo, Venezuela
Paris, France

WRITE FOR TECHNICAL INFORMATION AND BROCHURES

SAVE money

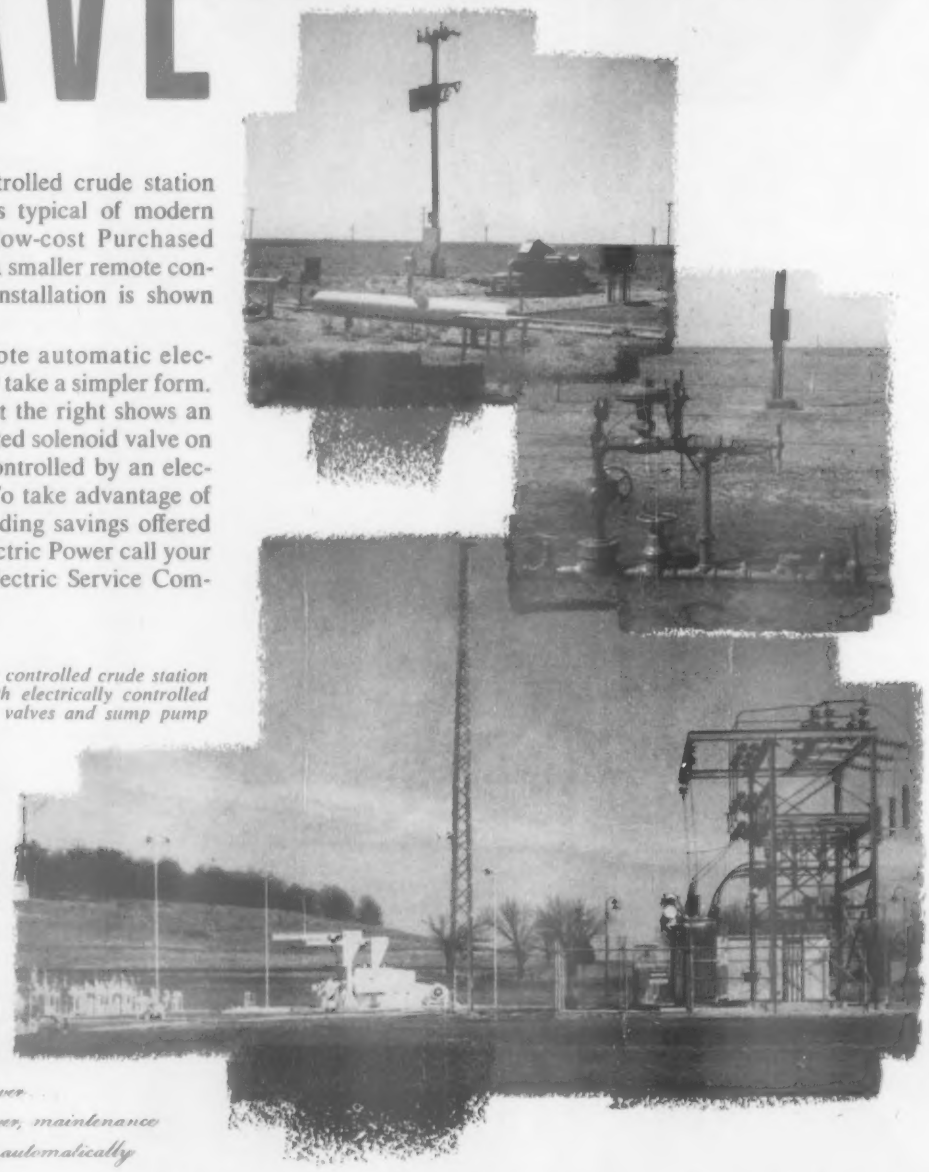
SAVE maintenance

SAVE manpower

SAVE with Remote Control

The remote controlled crude station pictured below is typical of modern application of low-cost Purchased Electric Power. A smaller remote controlled pipeline installation is shown at the top.

However, remote automatic electrical control may take a simpler form. The illustration at the right shows an electrically operated solenoid valve on a flowing well, controlled by an electric time clock. To take advantage of the many outstanding savings offered by Purchased Electric Power call your nearest Utility Electric Service Company or write us.



Remote controlled crude station with electrically controlled valves and sump pump

PEPA

Purchased Electric Power saves money, manpower, maintenance and serves you better automatically

Petroleum Electric Power Association

P.O. BOX 35006, DALLAS 35, TEXAS

CB&I CRAFTSMANSHIP IN STEEL

...the product of Engineering with Imagination

This unique vacuum tower was fabricated and erected by CB&I to meet an exacting set of performance requirements at the El Paso refinery of Standard Oil of Texas:

FEED: 13,000 barrels per day, reduced crude

NOMINAL PRESSURE: 2 pounds per square inch, absolute

OPERATING TEMP: 750 degrees Fahrenheit (approx.)

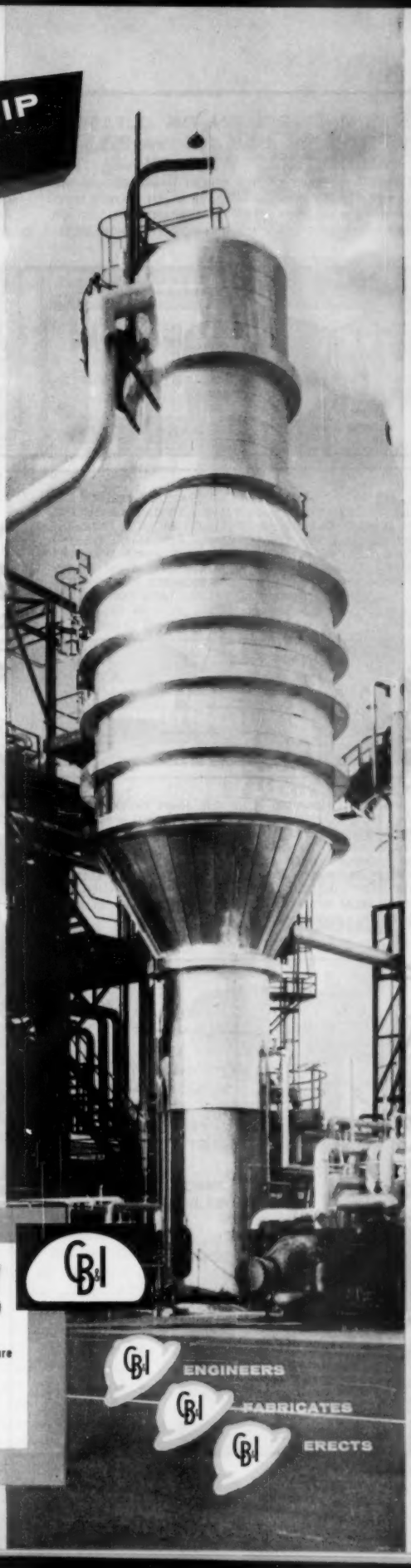
HEIGHT: 87 feet

DIAMETER: Varies from 8 to 18 feet

What is CB&I *Craftsmanship in Steel?* This unusual structure is a good example. It is engineering tempered with imagination. It is close attention to metallurgical control and structural detail. It is careful customizing of structure to process. Most important, it is *experienced coordination* through *all* phases of engineering, fabrication and erection.

These *coordinated services* are the reason why leading refiners rely again and again on CB&I for their critical tanks, towers and processing structures. For more information, write your nearest CB&I office, today. Ask for the brochure: *CB&I Craftsmanship in Steel.*

CB&I-built vacuum tower designed for reduced crude feed of 13,000 bpd. CB&I also built a reactor and regenerator, furnished through Fluor Corporation, Limited, for Standard Oil of Texas.



Chicago Bridge & Iron Company

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Plants in Birmingham • Chicago • Salt Lake City • Greenville, Pa. • New Castle, Delaware

SUBSIDIARIES:
Horton Steel Works Limited, Toronto; Chicago Bridge & Iron Company Ltd., Caracas; Chicago Bridge Limited, London; Chicago Bridge Construcoes Ltda., Rio de Janeiro

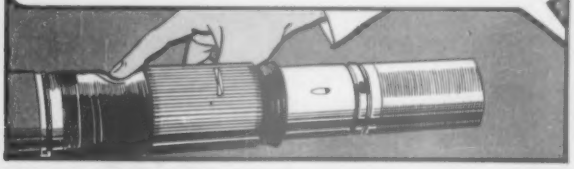
REPRESENTATIVES AND LICENSEES:
Australia, Cuba, England, France, Germany, Italy, Japan, Netherlands, Scotland

P84CB

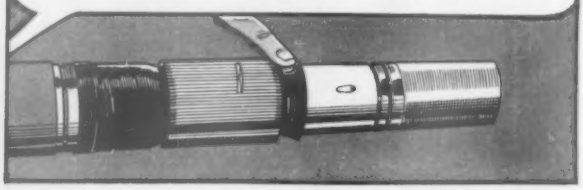
HERE'S A REPORT ON THE DURABILITY OF THE RUBBER-TYPE ELEMENTS USED IN OUR TYPE OF GAS LIFT VALVES — AND HOW THE DESIGN PRINCIPLE SAVED A SOUTH TEXAS WELL OWNER THE COST OF A CONVERSION WORKOVER.

THE VALVES COVERED BY THIS REPORT HAVE BEEN IN THE WELL FOR 5 YEARS NOW — AND HAVE GIVEN PERFECT SERVICE. WHAT'S MORE, THEY SAVED THE OPERATOR THE COST OF A WORKOVER JUST THREE MONTHS FOLLOWING INSTALLATION, WHEN THE WELL HAD TO BE CONVERTED FROM CONTINUOUS TO INTERMITTENT LIFT. THE WELL HAS BEEN PRODUCED INTERMITTENTLY SINCE THAT TIME AND THE WELL OWNER IS PLEASED WITH THE OPERATION OF THE VALVES.

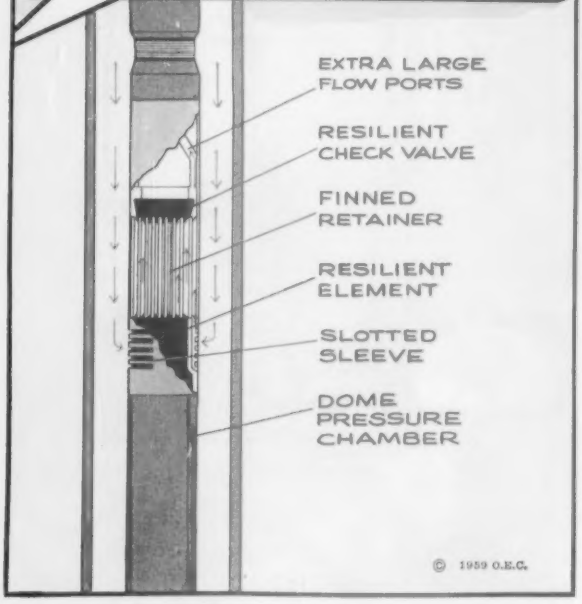
HERE, LET ME SHOW YOU THE MANY ADVANTAGES OF THE RESILIENT ELEMENTS IN OUR VALVES. FIRST, BECAUSE THIS MAIN ELEMENT IS RESILIENT, IT RESISTS EROSION FROM THE SYSTEM GAS. SECOND, THE FLOW AREA ACROSS THE ELEMENT IS THE LARGEST FLOW AREA OF THE VALVE, WHICH NOT ONLY HELPS TO REDUCE ANY CUTTING ACTION FROM THE SYSTEM GAS BUT MINIMIZES THE MOVEMENT REQUIRED TO ADMIT GAS FROM THE ANNULUS DURING OPERATION. THESE FEATURES ARE DESIGNED TO PREVENT FATIGUE.



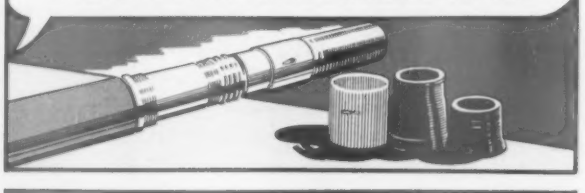
THE SAME PRINCIPLES APPLY TO THE CHECK VALVE HERE. IT COMPRESSES JUST SLIGHTLY AS GAS PASSES OVER IT, THEN — WHEN NECESSARY TO CHECK BACK PRESSURE FROM THE TUBING — IT FORMS A BUBBLE-TIGHT SEAL AGAINST THE FINNED RETAINER AND INSIDE WALL OF THE VALVE. AND THE RUBBER-TO-METAL SEAL PRINCIPLE OF BOTH RESILIENT ELEMENTS ELIMINATES THE EXCESSIVE WEAR NORMALLY ASSOCIATED WITH METAL-TO-METAL, STEM-AND-SEAT TYPE VALVES.



I'LL SHOW YOU HOW WE BOND THE MAIN VALVE ELEMENT TO THE VALVE MANDREL ASSEMBLY IN A MINUTE — BUT FIRST LET ME SHOW YOU THIS FLOW DIAGRAM OF OUR TYPE C GAS LIFT VALVE. PRESSURE FROM THE VALVE DOME HOLDS THE MAIN VALVE ELEMENT CLOSED ACROSS THE SLOTTED PORTS. WHEN GAS PRESSURE IN THE ANNULUS EXCEEDS THE SET PRESSURE OF THE VALVE, THE MAIN VALVE ELEMENT OPENS. WHEN THE PRESSURE FROM THE ANNULUS DROPS BELOW THE SET PRESSURE OF THE VALVE, THE VALVE CLOSES.

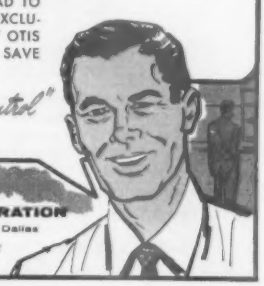


NOW HERE'S HOW WE BOND THE MAIN VALVE ELEMENT TO THE VALVE MANDREL ASSEMBLY. FIRST WE SERRATE THE SEALING SURFACES OF THE MANDREL ASSEMBLY TO GIVE IT A SUPERIOR BONDING SURFACE. THEN WE APPLY A SPECIAL BONDING CEMENT, SLIP THE RUBBER ELEMENT INTO PLACE, AND BAKE THE COMPLETE ASSEMBLY FOR ONE HOUR AT 375° F. THIS PRODUCES A PRESSURE-TIGHT SEAL AT THE ELEMENT END OF THE DOME CHAMBER. AS A RESULT, OUR VALVES CAN BE EXPECTED TO MAINTAIN THEIR SET PRESSURE INDEFINITELY.

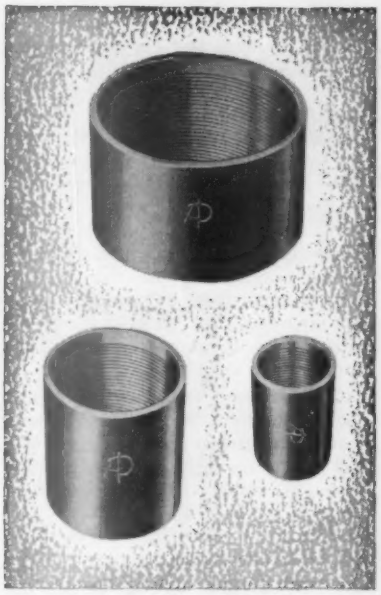


IF YOU'RE PLANNING A NEW GAS LIFT INSTALLATION AND WANT TO RUN VALVES THAT WILL STAY IN THE HOLE AND GIVE YOU TROUBLE-FREE SERVICE — INSTALL OTIS GAS LIFT VALVES. THEY HAVE NO METAL MOVING PARTS . . . NO BELLOWS TO FATIGUE . . . NO METAL SEATS TO CUT OUT . . . AND THEY'RE DESIGNED TO OPERATE CONTINUOUSLY OR INTERMITTENTLY WITHOUT HAVING TO BE PULLED FOR CONVERSION. CONTACT ONE OF OUR GAS LIFT SPECIALISTS AT THE OTIS OFFICE NEAREST YOU. HE'LL BE GLAD TO SHOW YOU THESE AND OTHER EXCLUSIVE FEATURES AND EXPLAIN HOW OTIS GAS LIFT VALVES ARE DESIGNED TO SAVE YOU MONEY.

Otis - "First in Gas Lift Control"



OTIS ENGINEERING CORPORATION
General Offices: 6812 Denton Drive Dallas
Branches Throughout the Oil Country



HARRISBURG
COUPLINGS

Harrisburg Seamless Steel Pipe Couplings are manufactured to A.P.I. and A.I.S.I. specifications for petroleum and other industries. The Harrisburg developed process assures uniformity of threading unsurpassed in accuracy of form, height, angle and lead. Order the best — order Harrisburg couplings.

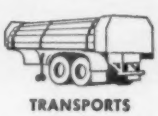
More than a Century (H) in Harrisburg 6, Pa.

HARRISBURG STEEL CO.
Division of HARSCO CORPORATION

CYLINDERS

FLANGES

TUBES


TRANSPORTS

They Say—

Ohio to provide facts

"Unless the businessman learns to talk meaningfully about issues important to voters, he will remain a 'special interest' pleader to both voters and legislators who represent him. Business must establish a close identification of itself with the interests of its employes and of the general public.

"The job of getting the business viewpoint across to the public is a job for all types of business and professional men. They can no longer afford the apathy which has cost them influence, prestige, and representation in federal, state, and local governments.

"Ohio Oil has always tried to function as a responsible citizen and has encouraged employes to participate in government and civic activities.

"Our attitude is that people will make the right decisions on public issues and elect to office statesmen who will act in the public good, provided they have adequate information. Ohio Oil Co. intends to provide more facts concerning vital economic and political issues which affect the company or its employes."

Howard H. West, vice president and a director, Ohio Oil Co., in a speech to South Bend, Ind., business and professional men.

Competition closed issue

"It will be recalled that the Government's primary objective in this suit (West Coast antitrust case) was to require our company to dispose of its retail marketing operations and thereafter stay out of the sales end of the oil business.

"This the court, following pretrial hearings, refused to do, after defendants demonstrated how extensive has been the competition in the oil business since the filing of the suit in 1950.

"The court also commented that the Government would not be likely to file this suit now, in the light of the competitive picture since 1950 and today.

"Although confident of ultimate exoneration in court, Standard entered into negotiations for a consent decree after the court had made these rulings and urged the parties to try to reach agreement in order to avoid a trial of the case which would take

SPECIFY
500 TON for
LONGER
THREAD LIFE!

Protects more tool joint threads than any other compound!

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USE JIMMIE GRAY DOPE BRUSHES

PETROLEUM DISTRIBUTING CO.
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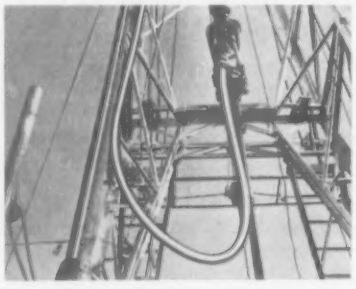
with Thermoid Brake Blocks

Make sure you get all the vital smooth braking action that's necessary for protection of costly drilling equipment. Make sure that every square inch of brake surface *works*.

You *can* make sure by specifying woven Thermoid Brake Blocks, which stand up to day-in day-out operation at highest temperatures. No crumbling; no loss of shape; no bleeding; no resin deposit on brake drums; no "chucking"; no "running-in" required.

Insist on Thermoid Brake Blocks on your original equipment, and when making replacements. Talk to the Thermoid distributor, or write *Thermoid Division, H. K. Porter Company, Inc., Tacony & Comly Sts., Philadelphia 24, Pa.*



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a year or more and be vastly expensive and burdensome to all parties.

"The court assured the litigants that settlement discussions would not be considered as weakness on the part of any of them or as a concession that defendants had done anything wrong.

"It is significant that the judgment expressly states that Standard, even though consenting to the decree, nevertheless does not in any way acknowledge that the Government's charges of combination and conspiracy have ever been justified.

"Furthermore, it will be noted that the decree precludes the Government from hereafter introducing in any suit or proceeding 'evidence to support any claims or contentions that prior to the date of entry hereof any two or more defendants jointly possessed such monopoly power or were otherwise guilty of any of the several violations of Sections 1 and 2 of the Sherman Act'."

Statement issued by Standard Oil Co. of California after settlement of the West Coast antitrust case by consent decree.

It could happen

"The industry must maintain prices of energy fuels at a level competitive with other energy sources. This will be possible only so long as it is permitted to and does continue its technological progress and is not prevented from operating efficiently by regulatory agencies or restrictive legislation.

"I cannot help but emphasize, however, that the prospects for the petroleum industry could be changed materially by any unwise action by state or federal agencies or by the industry itself on such matters as conservation, depletion provision, and import policy."

B. W. Pickard, vice president, Standard Oil Co. of California, Western Operations, Inc., in a speech to the Oil Heat Institute.

Signs of spring?

"We feel that the new (imports) program will meet its objective and provide incentives to spark domestic exploration and development.

"Of course, one swallow doesn't make a spring, and in matters such as these, relief is not just a swallow away. However, current trends are heartening and, I hope, indicative of things to come.

"On March 9, the day before the program became effective, well completions in 1959 were lagging behind

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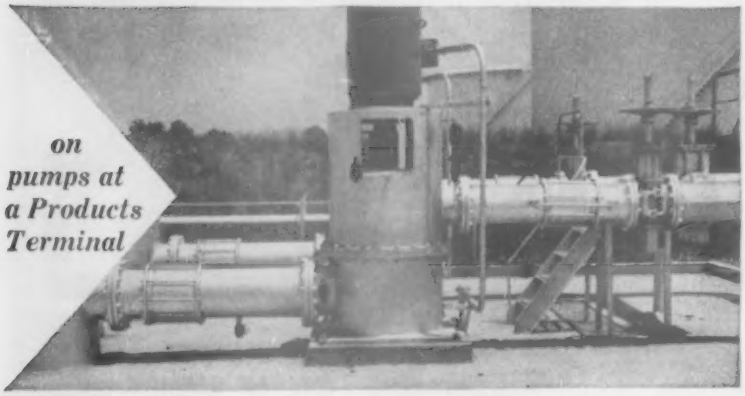

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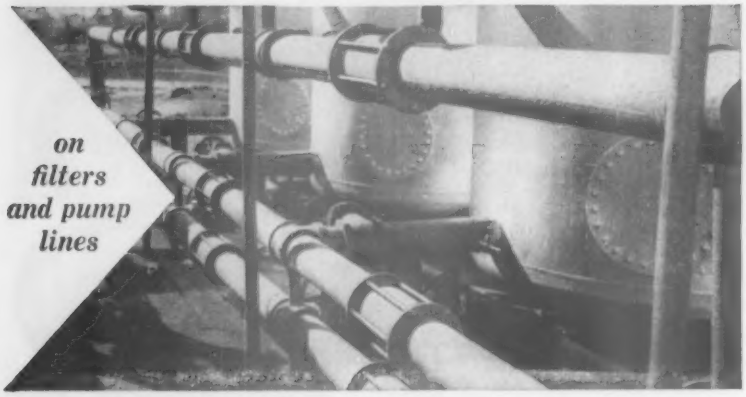

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year-earlier levels. At the same time, the number of rotary rigs active in the United States was about the same as during the similar period in 1958.

"Today, well completions have moved modestly ahead of year-ago levels. If current rates are sustained, total well completions in 1959 could easily increase over 1958.

"Also encouraging is the recent report of Hughes Tool Co. that active rotary rigs are at peak levels for the year and impressively ahead of the same period last year.

"This is the type of activity the program was meant to stimulate."

Capt. Matthew V. Carson, imports plan administrator, in a speech at the Interstate Oil Compact Commission meeting.

Gigantic roadblock

"The Interstate Oil Compact was formed in 1935 in order to assist the oil and gas producing states in the formulation of sound oil and gas conservation programs. This action was necessary if the states were to preserve their rights to regulate the production of oil and gas and not to abrogate this authority to federal jurisdiction.

"There are a number of important reasons for control by state instead of federal officials including: the state officials are familiar with the local production problems; they are directly answerable to the people and thus in more direct control of the situation; and it is possible to handle the problems with more speed and economy.

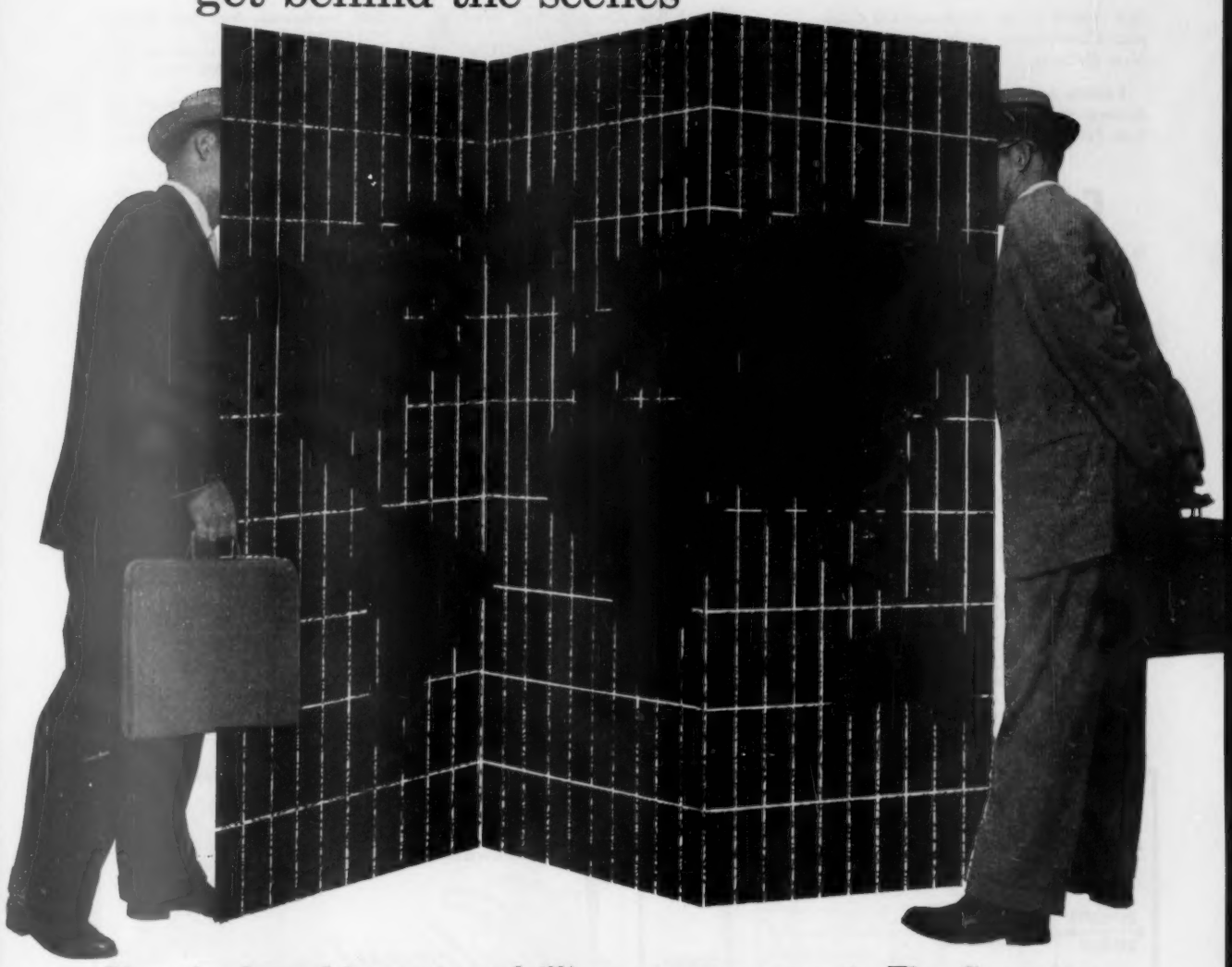
"The states must be alert at all times to protect their rights from the ever increasing encroachment of federal regulation. This was called to our attention recently by a decision of the Kansas Supreme Court in a case that dealt with a conflict of state regulation of gas conservation and the FPC rate jurisdiction. The FPC had not acted prior to July of 1954 concerning one aspect of regulation, although Kansas had been exercising jurisdiction for quite a period of time.

"The Kansas Court held that the state power is rendered inoperative immediately upon the mere passage of the act. The U. S. Supreme Court has not yet reviewed this decision.

"If the decision is upheld, we have the situation that at any time an act of Congress may confer jurisdiction upon a federal agency. This would be true even though the federal agency had previously made no attempt to regulate in this field. This places a gigantic roadblock in the way of state regulation . . ."

Gov. George Docking of Kansas,

get behind the scenes



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in a speech at the Interstate Oil Compact Commission midyear meeting in New Orleans.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

JULY

6-15 University of Michigan, short course on underground storage of natural gas, Ann Arbor, Mich.
10 Southern Gas Association, roundtable conferences for gas measurement superintendents, chief dispatchers, and gas-conditioning personnel, Mayo Hotel, Tulsa.
16-17 University of Michigan, research conference on underground storage of natural gas, Ann Arbor, Mich.
27-31 University of Minnesota, continuation course, techniques of chemical infrared spectroscopy, Minneapolis.

AUGUST

3-7 University of Minnesota, continuation course, chemical interpretation of infrared spectra, Minneapolis.
6 Southern Gas Association, American Gas Association, public relations roundtable conference, Heidelberg Hotel, Jackson, Miss.
7 Southern Gas Association roundtable conference on pipeline operation and maintenance, St. Anthony Hotel, San Antonio, Tex.
10-13 Society of Automotive Engineers, national West Coast meeting. Hotel Georgia, Vancouver, B. C.
10-28 Louisiana Polytechnic Institute, Lou-Ark section of AIME, graduate summer session in reservoir engineering, Louisiana Polytechnic Institute, Ruston, La.
12-15 Billings, Mont., Geological Society, tenth annual field conference, Disturbed Belt area of northwestern Montana, registration, August 12, Great Falls, Mont.
23-26 American Institute of Electrical Engineers, sixth electrical conference of the petroleum industry, Wilton Hotel, Long Beach, Calif.
24-25 North Dakota Oil and Gas Association, annual meeting, Grand Pacific Hotel, Bismark, N.D.
24-26 West Virginia University, annual Appalachian gas measurement short course, Morgantown, W. Va.
26-28 Pennsylvania Grade Crude Oil Association and Pennsylvania State University, twenty-first technical conference on petroleum production, Penn State campus, University Park, Pa.
27 Oil Centennial Day, Titusville, Pa.

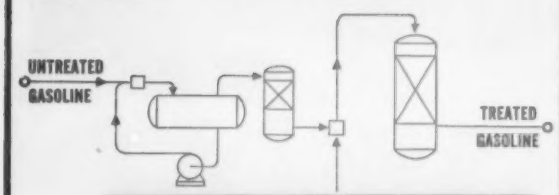
SEPTEMBER

9-11 Pacific Coast Gas Association, annual meeting, Ambassador Hotel, Los Angeles.
9-12 Intermountain Association of Petroleum Geologists, annual field conference, western high Uintas, registration, September 9, Provo, Utah.
10-12 Magic Plains Oil Exposition, Borger, Tex.
14-16 Texas Mid-Continent Oil and Gas Association, annual meeting, Rice Hotel, Houston.
16-18 Wyoming Geological Association, field conference, Big Horn Basin, registration, Cody, Wyo.
16-18 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.
17 Natural Gasoline Association of America, Rocky Mountain regional meeting, Wyoming-Gladstone Hotel, Casper, Wyo.
20-23 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Rice Hotel, Houston.
21-25 Instrument Society of America, annual instrument-automation conference and exhibit, International Amphitheater, Chicago.
23-24 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.
24-25 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division annual meeting, Roosevelt Hotel, New Orleans.
27-29 National Association of Oil Equipment Jobbers, annual convention and trade show, Hotel Leamington, Minneapolis.
29-30 Western Petroleum Refiners Association, management seminar, Western Hills, Waggoner, Okla.
28-Oct. 1 American Welding Society, fall meeting, Sheraton-Cadillac Hotel, Detroit.
29-Oct. 1 National Association of Corrosion Engineers, western region conference, Bakersfield Inn, Bakersfield, Calif.

OCTOBER

1-2 National Association of Corrosion Engineers, southeast region conference, Jacksonville, Fla.

TC SWEETENING



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2-3 Association of Desk and Derrick Clubs of North America, eighth annual convention, Hilton Hotel, San Antonio, Tex.

4-7 Society of Petroleum Engineers of AIME, fall meeting, Memorial Auditorium, Dallas, Tex.

5-7 American Gas Association, annual meeting, Conrad Hilton Hotel, Chicago.

5-7 National Association of Corrosion Engineers, northeast region conference, Lord Baltimore Hotel, Baltimore.

5-10 Society of Automotive Engineers, national aeronautic meeting, aircraft manufacturing forum, and aircraft engineering display, The Ambassador, Los Angeles.

7-8 Western Petroleum Refiners Association, fourth annual stream pollution and waste disposal conference, Broadview Hotel, Wichita.

7-10 Rocky Mountain Association of Geologists, eleventh annual field conference, Saratoga Inn, Saratoga, Wyo.

8-9 California Natural Gasoline Association, annual fall meeting, Huntington-Sheraton Hotel, Pasadena, Calif.

8-10 American Association of Petroleum Geologists, Southwestern Federation of Geological Societies, second annual regional meeting, Coliseum, Lubbock, Tex.

8-10 Exploration Drilling symposium, sponsored by University of Minnesota, Colorado School of Mines, and Pennsylvania State University, University Park, Pa.

8-11 Louisiana Gulf Coast Oil Exposition, Lafayette, La.

11-13 American Association of Oilwell Drilling Contractors, annual meeting, Skirvin Hotel, Oklahoma City.

11-16 American Society for Testing Materials, Pacific area national meeting, Sheraton-Palace Hotel, San Francisco.

12-15 National Association of Corrosion Engineers, south central region conference, Cosmopolitan Hotel, Denver.

13-14 Seventh Annual Gas Measurements Institute, National Guard Armory, Liberal, Kans.

20-22 American Standards Association, national conference on standards, Sheraton-Cadillac Hotel, Detroit.

20-22 National Association of Corrosion Engineers, north central region conference, Cleveland.

20-22 American Society of Mechanical Engineers, American Society of Lubricating Engineers, lubrication conference, Sheraton-McAlpin Hotel New York.

22-23 American Institute of Mining, Metallurgical, and Petroleum Engineers, Los Angeles Basin section, fall meeting, Huntington Sheraton Hotel, Pasadena, Calif.

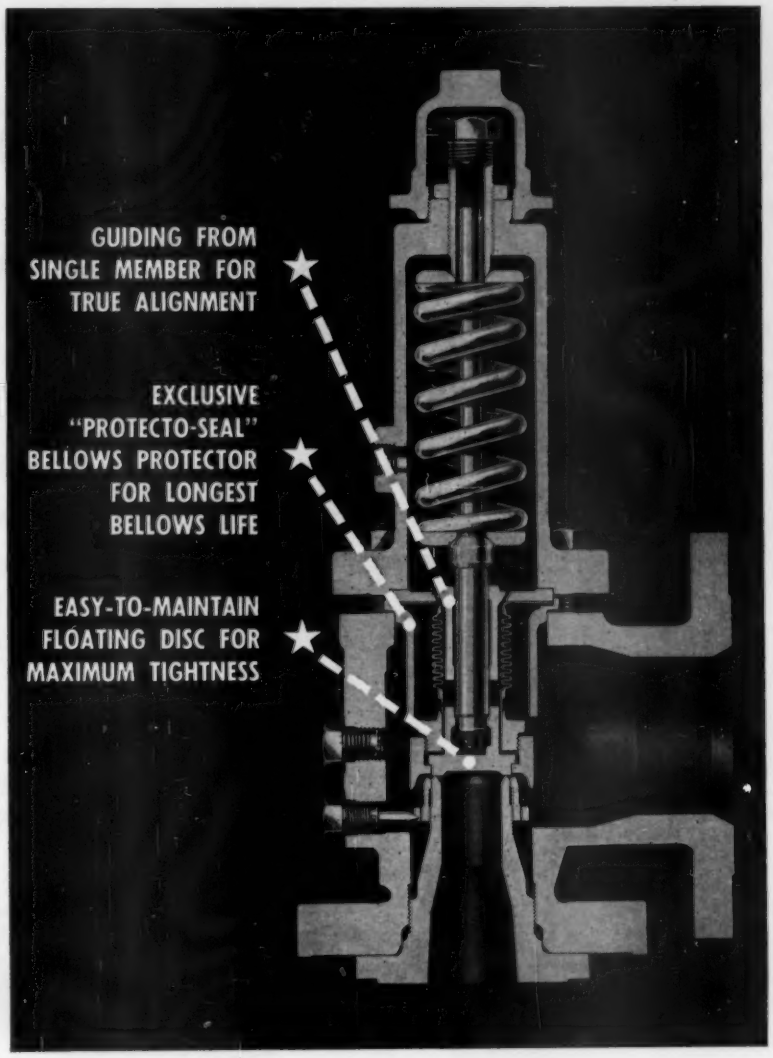
23 Natural Gasoline Association of America, southern regional meeting, Carlton Hotel, Tyler, Tex.

26-27 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

26-27 Independent Natural Gas Association of America, annual meeting, Westward Ho Hotel, Phoenix.

26-28 Society of Automotive Engineers, national transportation meeting, La Salle Hotel, Chicago.

28-29 Western Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.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JOURNALLY SPEAKING

Organization Oil Men

THE OTHER DAY we were listening to a prominent oil man speaking before a meeting of oil men and right in the middle of it he casually tossed out an offhand remark that knocked us out of our seat.

"What we need," he said, "is some good oil men. The trouble with our industry today is that we don't have any good oil men any more. We have lots of good gin players, but no good oil men."

That's a serious indictment. But before you rear up on your hind legs and indignantly scream "Why, I'm a good oil man. I know lots of good oil men. We're all good oil men" —pause and consider.

What is a "good" oil man?

He may be good from a moral standpoint. He obeys all laws, is kind to animals, and doesn't beat his wife more often than necessary.

He may be good from a technical standpoint. He's proficient at his job, is loyal to his company, takes only short coffee breaks, and earns his retirement annuity.

He may be good from a community standpoint. He belongs to the Chamber of Commerce, gives his dollar to the Red Cross drive without a whimper, and thoroughly agrees that somebody ought to do something to improve the oil industry's public relations.

If that makes a good oil man, then you're right—the industry is full of good oil men.

But that isn't what was meant by the man we quoted up above.

By "good oil men" he means men better than just good. All-around oil men. Leaders. Outstanding personalities. Dominant characters. Men who set the pace and name the pitch. Whom the whole industry looks to for inspiration and guidance. Who symbolize the industry for the public. Who could earn the title of "Mr. Oil."

You don't hardly find none like that no more.

We have lots of good geologists, good research men, good personnel directors, good refinery operators, good economic analysts, good product merchandisers, good public-relations men. But they're all "organization men," and they make a composite picture of middle-class mediocrity, professional preoccupation, leaderless loyalty, and perfunctory performance.

Oh sure we have a full roster of company officials, all very adept at keeping their stockholders out of their hair and themselves out of the limelight. But they never say anything that doesn't have the formal okay of their lawyers, economists, department heads, and public-relations advisors, nor anything that might be misinterpreted by a newspaper, a politician, a competitor, a customer, a friend, or an enemy, and so they never say anything period.

It's like a stable of docile draught horses who will work willingly in harness whenever a teamster gives directions. Contrast this with the stories you read as a kid about the herds of wild mustangs that used to roam the western plains, always dominated by a strapping stallion who bravely fought off wolves and hunters and craftily led his herd to safety.

It's leaders we need. The oil industry is wandering around in the wilderness like the Children of Israel without a Moses.

We recently made a swing around the oil patch and heard nothing but pessimism. Every oil man wondered where the oil business was headed and was certain that his branch of it was fast going to hell in a handbasket.

Nobody quite put it into words, but it was obvious that all were subconsciously wishing that a few forceful and outspoken men would rise above common level and give the industry a sense of direction, a course of action, a positive purpose.

What is wanted is neither a dictator nor a Pied Piper, but just a dozen or so men in various divisions of the industry with the color, the courage, and the common sense to be out in front of the pack pointing a way for the good organization men to follow.

That's what the speaker meant when he said we need some good oil men, and we agree with him. And neither of us has anything against good gin players.

—Henry D. Ralph.

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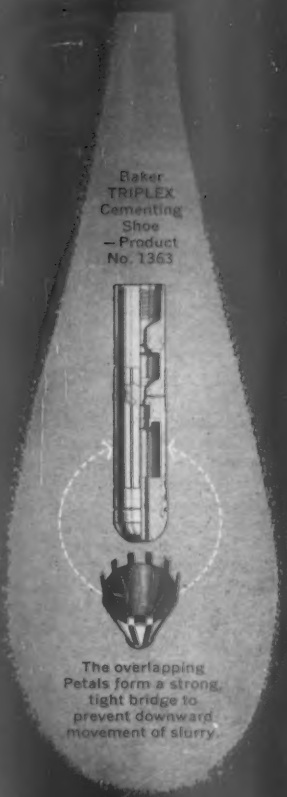
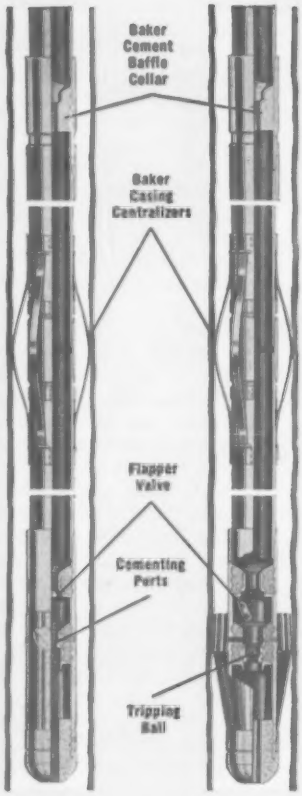


Cementing casing at a predetermined point above bottom, and at the same time protecting a lower, permeable zone from cement contamination always has been a difficult problem. Such work is now a routine operation with a Baker TRIPLEX Cementing Shoe.

A special float shoe is combined with a Baker Metal Petal Basket that expands to form a bridge and retain cement slurry **above** the Basket, even in large-diameter or irregularly shaped holes. The TRIPLEX Shoe, with its flapper-type back-pressure valve, operates as a conventional **float** shoe while landing the casing and conditioning the hole. When cementing is done and pump pressure is stopped, the valve closes and cement is **held in place behind the casing until it sets.**



Baker Casing Centralizers are installed on (and above) the shoe joint, thus providing a uniform annulus to receive the slurry. While running-in, a Hold-Down Strap (secured by shear screws) retains the Basket against the TRIPLEX Shoe, and the cementing ports are covered by the Tripping Valve. After reaching the desired point, a Tripping Ball is dropped to seat upon the Tripping Valve. Pressure is applied to shear the screws, force the Tripping Valve downward, and expose the cementing ports. This action releases the Hold-Down Strap and the Basket expands against the walls of the hole. When cementing starts, the slurry is directed upward by Baker "Whirling" Action, and retained **above** the shoe by the Metal Petal Basket.

BAKER OIL TOOLS, INC., HOUSTON • LOS ANGELES • NEW YORK

Speaking of economic nonsense . . .

CAPTAIN CARSON, the imports administrator, says it would be "economic nonsense" for a refiner to increase his crude runs for the purpose of getting a bigger import quota in a future allocation period.

In a recent speech he gave a detailed computation to prove this. His mathematics is unassailable but his premise is shaky. Since when have refiners refrained from engaging in economic nonsense?

Granting that the method of allocating import quotas is not the cause of high runs, it is refiners themselves who must take the blame for the economic nonsense of recent weeks.

GASOLINE DEMAND during May and June was about 2.5% above last year. Refinery runs were about 6% higher. Gasoline stocks rose to about 5.5% above last year. The wholesale price of gasoline dropped about 7%.

Unless refiners have a well-reasoned plan to bring down the general level of petroleum prices, there can be no other explanation for those figures than economic nonsense.

To an individual plant manager concerned only with his own unit manufacturing costs it may make sense to increase runs up to maximum capacity because of the low cost of those extra "incremental barrels."

But it is economic nonsense for his management to let him do that if those extra barrels must either be stored at considerable expense or sold at prices which undermine the return on the entire volume of output.

It costs a refiner between 2 and 3 cents per month to hold a barrel of crude oil in storage and between 3 and 4 cents a month to carry a barrel of refined products in inventory. So it is economic nonsense to carry unneeded stocks of either, but more nonsensical to carry the inventory in the form of refined products.

It is also economic nonsense for refiners to think they can sell the incremental barrels produced beyond their normal market demand at prices below prevailing quotations but still above the incremental barrel cost. The market just won't hold up under that practice.

Such price shadings don't increase consumption one gallon. They simply bring a chain reaction of downward quotations. The result, as we see today, is a lower price not only for the incremental barrels but for the total supply.

NEITHER TOTAL IMPORTS nor the allocation formula is responsible for the oil industry's poor health. The fault lies with the top management of refining companies.

To produce more gasoline than can be sold, and to undermine its price at the peak of the consuming season and at a time when refinery margins are close to the profitless point anyway, is economic nonsense that threatens to bring on a widespread and prolonged period of distress for the entire petroleum industry.

NICKEL ALLOYS PERFORM BETTER LONGER. Bottom-hole pump being lowered into well has barrel tube and all vital parts of corrosion-resisting Monel alloy to assure long pump life in well with high sulfur-content crude. Information about pump? Write Harbison-Fischer Manufacturing Co., Fort Worth, Texas.

Steam heated crude containing molten sulphur poses no corrosion problem to this Harbison-Fischer bottom-hole pump of Monel* nickel-copper alloy. Area is so heavily sulfur-laden that commercial quantities of sulfur are produced along with the crude. Monel alloy resists corrosion by high sulfur-content crude, resists erosion too, to keep pumps working efficiently. Need help with corrosion problems? Get it by contacting Inco.

*Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

INCO NICKEL ALLOYS

Steady Course Is Seen for Imports

• May total indicates imports are stabilizing. Volume was up 166,000 bbl. over preceding month, but it was close to quota for period ending June 30 and still short of second-half daily allowable.

OIL IMPORTS, which have followed an erratic course in the past 6 months, show promise of leveling off in the second half of the year.

The second monthly report under the mandatory control program, released last week by Import Administrator Matthew V. Carson, Jr., listed imports averaging 1,403,344 bbl. daily in May.

Imports in May were up sharply over the 1,237,041 bbl. daily reported by Carson for the preceding month. But the latest total is still short of the daily allowable of more than 1,450,000 bbl. which has been set for the second half.

Figures compiled by Carson's Oil Import Administration include "overland" imports but not bonded oil brought in for use outside the country. Imports in these categories are exempt from the mandatory control program which replaced voluntary controls last spring.

The transition from voluntary to mandatory controls was a big factor in the sharp fluctuations in imports during the first half.

Since importers may use their entire 6-month quota at any time during the quota period, fluctuations will continue on a month-to-month basis. But future shifts in the import rate will be determined more by tanker availability, market demand, and other "natural" factors rather than by frenzied efforts to beat deadlines.

The president's proclamation establishing the new control program went into effect March 11 for crude and unfinished oils and April 1 for residual and other products. It brought a sharp drop in imports following the abnormally high level reached in anticipation of stiffer controls.

Greatest fluctuations have been in crude and unfinished oils and finished petroleum products other than residual fuel.

For the 8 months preceding the adoption of mandatory controls, Carson reported crude and unfinished-oil imports averaging 1,129,700 bbl. daily. From March 1-10, just before the new program went in effect, crude and unfinished oils were coming in at a rate of about 1,090,000 bbl. daily.

In the remainder of March, the rate dropped sharply to about 880,000 bbl. daily. A further drop in April brought crude and unfinished imports into continental United States to ap-

Crude, Unfinished Oil Imports in May . . . barrels per day

Districts 1-4

Importers	Crude Oil	Unfinished Oil
Advance Refining	939	
Allied Materials	903	
Anderson-Prichard	5,749	
Ashland Oil & Ref.	20,478	
Atlantic Refining	32,837	
Aurora	5,644	1,262
Bay Refining	3,757	
Bayou State	310	
Bell Oil & Gas	3,952	
Big West Oil of Montana	903	
Calumet Refining	735	
Champlin	7,347	1,020
Cities Service	25,598	
Clark Oil & Refining	3,392	1,163
Continental	14,044	
Cooperative Ref. Assn.	4,129	
Cotten Valley Solvents	1,228	
Derby Refining	6,720	
Eastern States	14,441	
Evangeline Refining	361	
Farmers Union	6,828	
Great Northern	20,310	
Gulf	71,252	6,897
Hess, Inc.	4,407	
Ida Gasoline	79	
Illinois Farm Supply	1,698	
International Refineries	9,749	
Ingram Oil & Ref.	6,273	
Kerr-McGee	9,677	
La Gloria Oil & Gas	252	
Lakehead Pipeline	210	
Louisville Refining	2,963	
Malco Refineries	2,171	
Marvel Refining	361	
Murphy Corp.	6,038	
Naph-Sol Refining	2,132	
National Coop. Ref.	4,129	
Northwestern Refining	9,419	
Ohio Oil	10,314	
Osceola Refining	722	
Phillips	33,695	
Pontiac Refining	6,783	
Republic Oil	6,386	1,154
Rock Island	5,696	
Seminole Asphalt		68
Shell	24,904	
Sinclair	32,476	4,184
Socony Mobil	39,649	
Standard of Calif.	47,501	3,553
Standard of Indiana	33,214	1,060
Standard of New Jersey	40,536	2,567
Standard of Ohio	19,548	
Sun	40,286	
Sunray Mid-Continent	10,397	1,806
Suntide Refining	12,581	
Texaco	33,161	4,819
Tidewater	18,730	
Uinta Oil Refining	498	
Union Oil	43	
United Refining	1,901	
Vickers Petroleum	2,013	
Wickett Refining		108
Wolf Head	75	
Totals	**732,524**	**29,661**

District 5

Importers	Crude Oil	Unfinished Oil
Douglas	2,742	
Macmillan	194	129
Manespo Refining	4,077	
Mohawk Petroleum	4,264	
Richfield	27,104	3,042
Shell	15,387	
Socony Mobil	19,294	
Standard of Calif.	25,280	
Texaco	17,221	
Tidewater	27,571	
Union Oil	6,275	93
U. S. Oil & Refining		2,052
Wilshire	14,938	
Totals	**164,347**	**5,316**

Puerto Rico

Importers	Crude Oil	Unfinished Oil
Caribbean Refining	14,844	2,547
Commonwealth	47,439	
Gonzales Chemical	2,346	
Totals	**64,629**	**2,547**

Finished Products Imported in May

(Barrels per day)

Importers	Residual	Other products
District 1-4		
Asiatic Petroleum	35	21
Ballard Oil of Hartford	6,514	483
Jos. H. Blanchet		4
Belcher Oil	1,376	
Buckley Bros.	3,289	
Canadian National Railways		7
Colonial Oil Industries	1,041	
Dryco Co.		4
Gulf	3,350	
George Hall Corp.	1,042	
Hess, Inc.	38,340	2,468
Inland Terminal	46	
George T. Kaneb	70	
Lubrizol Corp.		4
Metropolitan Pet.	10,451	2,910
Military (MPSA)	1,022	14,994
New England Pet.	20,708	
Paragon Oil	42,704	810
Peirce Bros.		8
Robinson Lumber		6
Royal Petroleum	2,050	1,921
Shell	3,287	13,243
Shell Caribbean	23,034	
Socony Mobil	16	
C. H. Sprague & Son	23,077	
Standard of California		4,853
Standard of Indiana	32,261	
Standard of Kentucky	13,027	
Standard of New Jersey	116,520	4,039
Steuart Petroleum	7,541	
White Fuel Corp.	3,257	
Totals	**354,058**	**45,775**
District 5		
Military (MPSA)		4,243
City of Seattle		28
Total		**4,271**
Puerto Rico		
Tropical Gas Co.		216

proximately 767,000 bbl. daily, far below the permissible level.

Last week, Carson noted that imports of crude and unfinished oils had averaged 931,848 bbl. daily in May, excluding imports into Puerto Rico. The increase offset some of the abnormally low rates during the early days of the new program. The May figure compares with quotas set at about 915,000 bbl. daily for the second half of the year.

The cutback in imports of finished products, other than residual fuel, has been even sharper than for crude and unfinished oils.

In 1958 finished products came in at the rate of approximately 145,000 bbl. daily. In April the rate dropped below 70,000 bbl. daily, and in May it fell further to approximately 50,000 bbl. daily.

Rest of year . . . Second-half quotas for finished products have been set at 83,384 bbl. a day.

In addition to controlled imports, exempt oil is expected to be brought in at the rate of 250,000 bbl. or more daily in the second half of the year. If the present trend continues, actual imports into the U. S. and Puerto Rico during the next 6 months are expected to average around 1,700,000 bbl. daily.

Allocations for Puerto Rico have been set at slightly over 83,000 bbl. daily. Second-half imports into continental United States, then, are expected to average over 1,600,000 bbl. daily. This compares with actual imports of 1,756,000 bbl. daily during the second half of last year, as compiled by the Independent Petroleum Association of America.

The import level in the second half will depend not only on the amount of non-quota Canadian and bonded oil brought in, but on the stability of the mandatory control program as well.

Attacks . . . Portions of the program have been challenged by two federal court cases in Houston, and there is persistent talk of a broadside attack by one of the major importing companies.

If the program survives court action, there is still a strong possibility of major revisions in import quotas before year's end. Administration officials insist the program is under constant review, and they have shown little reluctance in the past to change the controls to meet changing conditions.

Many companies also are trying again to obtain individual relief through the oil import appeals board. If granted, petitions filed to date would increase quotas approximately 300,000 bbl. a day during the second half.

But past experience with the appeals board indicates slim hope for obtaining relief there.

Board Chairman Royce A. Hardy reported last week that 81 petitions for relief had been filed for the period March 11-June 30. After completing action on all pending cases for the initial quota period, the board had approved new or increased quotas for only six firms.

The successful appellants include Signal Oil & Gas Co., which was awarded a quota of 3,200 bbl. daily; Texas Asphalt & Refining Co., 1,600; Gabriel Oil Co., 2,000; Gonzales Chemical Industries, 736; Metropolitan Petroleum Corp., 5,373; and Tropical Gas Co., Inc., about 65 bbl. daily.

Special quotas granted by the board increased overall allocations approximately 12,974 bbl. daily.

Two Firms Sold

. . . to Associated. Included are production, three rigs, and gasoline plant.

ASSOCIATED Oil & Gas Co., Houston, is buying two other Texas oil companies through an exchange of stock valued at slightly more than $3,400,000.

The two companies are Timberland Exploration Co., a producing and drilling company, and South-Tex Corp., owner of a gas processing and recycling plant.

Harry J. Mosser, board chairman for Associated, said the newly acquired companies will operate as subsidiaries.

Timberland owns an interest in 12,278 acres of producing and nonproducing leases in Newton, Orange, Tyler, Waller, Harris, and Jasper counties, Texas. It has 17 deep Wilcox and Frio producing gas and oil wells with production valued at $35,000 per month. Mosser said Timberland has a number of shut-in wells which will produce and three recent discoveries.

Timberland also owns three drilling rigs under lease to Prince Marine Drilling & Exploration Co., a firm controlled by Associated. H. G. Sutton will continue as president of Timberland.

South-Tex deal . . . South-Tex's gas plant, in Nueces County, Texas, has a capacity of 75 million cubic feet of raw gas daily and a 75-mile gas gathering system. It is located 25 miles west of Corpus Christi in Agua Dulce field and currently is processing 40 million cubic feet of gas daily.

This throughput, Mosser said, will be increased substantially by extending the gathering system 30 miles into Jim Wells County to connect with new gas fields discovered and developed recently by Associated and affiliated companies.

Mosser is president of South-Tex, and L. M. Fischer, a director of Associated, is manager of the gas plant. Both will continue in these capacities.

Plants Strikebound

. . . after Amoco, OCAW fail to agree on craft lines.

THE ISSUE of work assignment and job classification closed two refineries last week, idled nearly 2,000 workers and caused crude purchases to be cut 170,000 bbl. daily.

Affected are two American Oil Co. plants, the 157,000-bbl. Texas City refinery and the 45,000-bbl. refinery at El Dorado, Ark.

Management and representatives of the Oil, Chemical, and Atomic Workers Union failed to reach agreement on the issue and the plants underwent orderly shutdowns. American Oil is a subsidiary of Standard Oil Co. (Ind.).

Effect on crude buying was immediate. Indiana Oil Purchasing Co. cut off crude buying in South Arkansas and Northern Louisiana fields, which had been supplying the Arkansas refinery with volumes varying from 33,400 to 37,600 bbl. daily.

Purchases for the Texas City plant dipped to 40% of allowables. This cut crude takes from the Texas Gulf Coast and the Scurry County area of West Texas about 135,000 bbl. daily.

Plant Manager B. F. Babin at Texas City said the company "cannot accede to the union demands to eliminate or restrict the company's responsibility to manage its plant for the long-range security of all its employes."

American Oil at Texas City has laid off much of its work force in recent months as a result of job-efficiency studies. Currently, it has about 1,750 employes at this plant, of which 1,250 are affected by OCAW contract. Personnel at El Dorado numbers 375.

Management was willing to sign a new contract without change, but the union demanded a number of changes, not only in work-assignment clauses but in employe benefits. Negotiations at Texas City continued almost until the strike deadline last Wednesday night and then were broken off. A federal labor mediator, James O. Hubbard, sat in on the talks.

Previous strike . . . The work assignment issue was behind two other refinery strikes earlier this year at Shell's Wood River, Ill., plant and Gulf's Port Arthur, Tex., plant. Shell withdrew its plan for a crafts assignment pool, but Gulf obtained a contract clause giving it more authority to assign workers to various jobs.

At Baton Rouge, Esso Standard Oil Co. abandoned its refinery mechanic classification during union negotiations.

watching WASHINGTON

Joe Reilly

• Big depletion threat still ahead . . .

NOW THAT the Senate's scrimmage on the depletion allowance is out of the way, the oil industry is bracing for a much more serious threat later this year.

The oil and gas depletion rate will be one of many tax provisions to be studied by the House ways and means committee at hearings starting in November.

Under the leadership of Chairman Wilbur Mills (D-Ark.), the committee will hear arguments for and against the present 27½% rate on oil and gas. Decision of the committee presumably will be based on a long and careful study of the facts. It will carry more weight in the House than a depletion vote which the Senate pushed through in one of its midnight floor shows.

The surprising thing about the Senate vote on depletion late last month was not so much the tally itself, but the fact that a vote was demanded at such an inopportune time. The anti-depletion crowd, led by Sen. Paul Douglas (D-Ill.), insisted on the showdown in the face of almost certain defeat.

OUTCOME OF THE VOTE can not help but be heartening to the industry. Only 21 senators voted for the Douglas amendment, which would graduate the depletion allowance from 27½% down to 15%. Douglas received 10 fewer votes than his colleague, Sen. William Proxmire (D-Wis.) got on a similar measure last year.

On the other hand, only 54 senators voted against the Douglas amendment. Last year, 58 voted against the Proxmire measure.

On the surface, the vote represented a decisive setback for Douglas, Proxmire, et al. They had practically abandoned hope of getting a majority vote this year. All they were aiming at was to beat last year's vote.

Futility of their tactics was obvious in advance. They tried to attach the depletion-cutting amendment to a House bill extending wartime corporate and excise taxes. They had 5 days to get the bill through the Senate, clear it through a conference committee, get any compromise measure through both houses, and send the finished product to the White House. If the bill were held up beyond the end of the fiscal year, June 30, the U. S. treasury would lose something like $9,000,000 a day.

COMFORTING AS IT MAY BE, the 54-21 vote against the Douglas amendment doesn't mean much. Some of the "nays" appear to have been directed more at the timing of the bill than the bill itself.

Four senators, all Democrats, who voted for the Proxmire amendment last year were recorded against the Douglas measure this year. They include Albert Gore of Tennessee, Everett Jordan of North Carolina, and Mike Mansfield of Montana, all of whom voted against the Douglas amendment. Also included is ailing Joe O'Mahoney of Wyoming, who went on record against the Douglas measure but wasn't present for the vote. Two others who were with Proxmire last year failed to record their sentiments this year. They are John Kennedy (D-Mass.) and Alexander Wiley (R-Wis.).

The vote itself doesn't represent true sentiment of the Senate, either on the depletion issue or on Douglas' maneuvering. More than 20 senators were absent the night of the vote. Many of them were delegates to a parliamentary conference in Canada; others were excused to attend ceremonies opening the St. Lawrence Seaway.

Counting not only the actual vote but the expressed sentiment, Douglas had 29 senators on his side this year. On the same basis, the total against him was 62.

Of the 18 newcomers in the Senate, only three voted with Douglas. Two others were recorded on his side but didn't vote.

Examiner Approves Transwestern Line

• Quick decision is now expected from the FPC, itself. Examiner's ruling rebuffs the FPC staff, which recommended denial of a certificate for the big line to move gas to California. Oral arguments now set for July 14.

A FEDERAL Power Commission examiner has approved Transwestern Pipeline Co.'s proposal to provide a new gas supply for expanding markets in southern California.

The ruling, subject to review by the commission, authorizes Transwestern to construct a 1,809-mile pipeline from Texas to the Arizona-California border near Topock, Ariz. Cost of the project is estimated at $191,700,000.

In approving the project, Presiding Examiner Harry W. Frazee overruled the FPC staff and California Public Utilities Commission which had objected to high gas prices set by Transwestern contracts.

He had high praise for the aggressiveness with which the newly formed company acquired the necessary gas reserves to meet the growing demand of the southern California markets.

The ruling also favors the granting of certificates to 14 independent producers and one pipeline company, authorizing them to sell natural gas to Transwestern.

Oral argument before the commission has been set July 14, indicating the likelihood of a quick decision on the examiner's ruling.

Under an order issued earlier, the period for filing exceptions to the decision has been reduced from the usual 20 days to 10 days. The FPC's earlier order provided for oral argument "at the earliest possible date" after the 10-day filing period.

Ready to go . . . Transwestern has made all possible preparations to expedite construction in order to meet commitments to start gas service to California this winter.

Pipe has already been fabricated and most of it has been delivered to the right of way.

Contracts for much of the construction were negotiated some time ago with Houston Contracting Co. and H. C. Price Co.

This is a practice often followed when FPC approval has been late in coming and a pipeline is working against a deadline. Transwestern is in a position to move immediately once the project has cleared FPC.

What's involved . . . Transwestern plans to sell initially 300 million cubic feet of gas daily to Pacific Lighting Gas Supply Co. for resale through distribution companies in southern California.

Previously announced plans call for increasing deliveries to 350 million cubic feet daily within 4 years of the project's completion. Pacific Lighting also has been given first chance at additional volumes as they become available, up to 640 million cubic feet daily.

Main line of the Transwestern system is to originate near Roswell, N. M. It would be 30-in. in diameter and about 670 miles long.

Two lateral lines are to feed gas to the Roswell Junction. One, including 252 miles of 20 and 24-in. pipe, is to extend from Puckett field, Pecos County, Texas. The other, a 24-in. line, would extend from Canadian, Hemphill County, Texas, 298 miles to Roswell.

One condition . . . Under Frazee's ruling, Transwestern's certificate would have one condition.

This would prohibit the company from paying dividends on its common stock until its 5% iterim notes are converted into stock or until its long-term debt has been reduced to 75% of the total capitalization.

The condition was imposed in recognition of the 85% ratio of debt to total capitalization. Normally, the FPC favors limitation of company debt to not more than 75%.

But the examiner flatly rejected the California Public Utilities Commission recommendation that price conditions be attached to the sales certificates. He was even sterner in his opposition to the FPC staff, which had recommended denial of Transwestern's application.

Gas is needed . . . Frazee concluded that there was an urgent need for the additional gas in southern California, both because of diminishing supplies and because of the increasingly critical air-pollution problem.

He said both Transwestern's gas and additional supplies which El Paso Natural Gas Co. proposes to furnish the area "are urgently required" to meet the actual and anticipated growth in demand. El Paso is now the only supplier of out-of-state gas to the California market.

The examiner held that it would be economically feasible for the distributors to meet the delivered price of 45 cents per M.c.f. for gas at the California border. Frazee noted that the companies are paying from 29¼ to 29¾ cents for gas purchased from El Paso and from local sources.

Addition of the Transwestern gas at about 49½ cents at the market areas would result in an over-all delivered gas supply costing about 33 to 33⅓ cents per M.c.f.

In opposing the Transwestern application, the FPC staff objected that the company had shown only a 13-year gas supply.

Frazee pointed out, however, that it was reasonable to conclude that reserves would be steadily increased from leases already dedicated to the company and from future purchases in the areas to be served by its gathering lines.

Gas not costly . . . Frazee said that Transwestern had been able to acquire its vast reserve of gas at an average cost of approximately 19.36 cents per M.c.f.

"This is an accomplishment of some proportion," he said, "for no pipeline company in recent times in South Louisiana or elsewhere has been able to assemble such a quantity of reserves of natural gas at such a low average initial cost."

Transwestern's contracts for West Texas - Permian basin gas generally provide for initial prices of from 12 to 16 cents, with 1-cent escalations each 4 years.

In the Panhandle - Hugoton area, Transwestern offered 23 cents the first 10 years and 26 cents the next 10 years in 20-year contracts. One contract, with Cities Service Gas Co., is for 5 years at a flat rate of 21 cents.

Rates acceptable . . . In answer to objections raised about the prices, Frazee said the rates "do not, when the evidence is all in, arouse suspicion or indicate the existence of a situation that would be contrary to the public interest."

He said that initial prices fixed, as in this case, by well-known pro-

ducers and a competent purchaser carry the presumption of justness and reasonableness.

Those who would overturn this presumption, he said, "carry the heavy burden of making a convincing showing that the initial prices are unlawful because they are too high and therefore unjust and unreasonable."

The producer, he said, has a legal right to fix the initial selling price of his gas, and the initial price is subject only to review by the FPC in rate proceedings under the Natural Gas Act.

Producers who have contracted to sell gas to Transwestern include Gulf Oil Corp., Pure Oil Co., Monsanto Chemical Co., Sun Oil Co., Humble Oil & Refining Co., Union Oil Co. of California, Warren Petroleum Corp., British-American Oil Producing Co., Curtis R. Inman, Richardson & Bass, G. H. Vaughn, Jr., et al., Superior Oil Co., Magnolia Petroleum Co., and Hunt Oil Co.

Prospects brighter . . . As in the case of most new pipeline companies, Transwestern had a long, uphill fight before getting tentative approval from an FPC examiner. But if the commission's past performance can serve as a criterion, Transwestern had reason to hope last week that it was on the downhill slope.

Transwestern was organized by J. R. Butler, Houston; Warren Petroleum Corp., Tulsa, and Monterey Oil Co., Los Angeles.

Trunkline Launches Big Expansion Program

- **Contracts are let to 11 firms in $81.5-million pipeline project.**

TRUNKLINE Gas Co. has awarded contracts to 11 companies to build 881.5 miles of looping and extensions for its $81.5-million expansion program approved in May.

Work will start shortly, and Trunkline hopes to have it completed by the end of the year.

The contracts cover 178.3 miles of gathering lines in Texas and Louisiana; 504.1 miles of looping in Texas, Louisiana, Mississippi, Tennessee, and Illinois; and 198.8 miles of new line in Illinois and Indiana.

Contracts for gathering lines are:

. . . 48 miles of 16-in. and 31 miles of 4 to 12-in., from Hitchcock, Tex., to Katy, Tex. (two spreads), H. H. Null, Inc.

. . . 24.5 miles of 12-in., from Lowry, La., to Cameron Parish shoreline, Sam Carline, Inc.

. . . 6.6 miles of 12-in., to Block 67, Cameron Parish, Sharman, Allen, Gay & Taylor, Inc.

. . . 43.3 miles of 4 to 20-in., from Lowry, La., toward shoreline, Vermilion Parish, Western Pipeline, Inc.

. . . 19.6 miles of 16-in. in marsh and 5.3 miles of 14-in. in Gulf to Block 26, Vermilion Parish (two spreads), Sharman, Allen, Gay & Taylor, Inc.

Looping contracts are:

. . . 41.9 miles of 24-in., from west of Moss Hill, Tex., to Silsbee, Tex., Sharman, Allen, Gay & Taylor, Inc.

. . . 53.3 miles of 30-in., from Pitkin, La., to Pollock, La., Grayco Constructors, Inc.

. . . 61.4 miles of 30-in., from Pollock, La., to pipeline valve 63, APV Co., Inc.

. . . 118 miles of 30-in., from Kilbourne, La., to Ballentin, Miss. (two spreads), Panama, Inc.

. . . 57 miles of 30-in. from Polk, Tenn., to Brownsville, Tenn., C. S. Lenoir Construction Co.

. . . 60 miles of 30-in. from Brownsville, Tenn., to Canadaville, Tenn., and from Bardwell, Ky., to Polk, Tenn., Panama, Inc.

112.5 miles of 30-in. from Marion, Ill., to Neoga, Ill. (two spreads), Panama-Williams Corp.

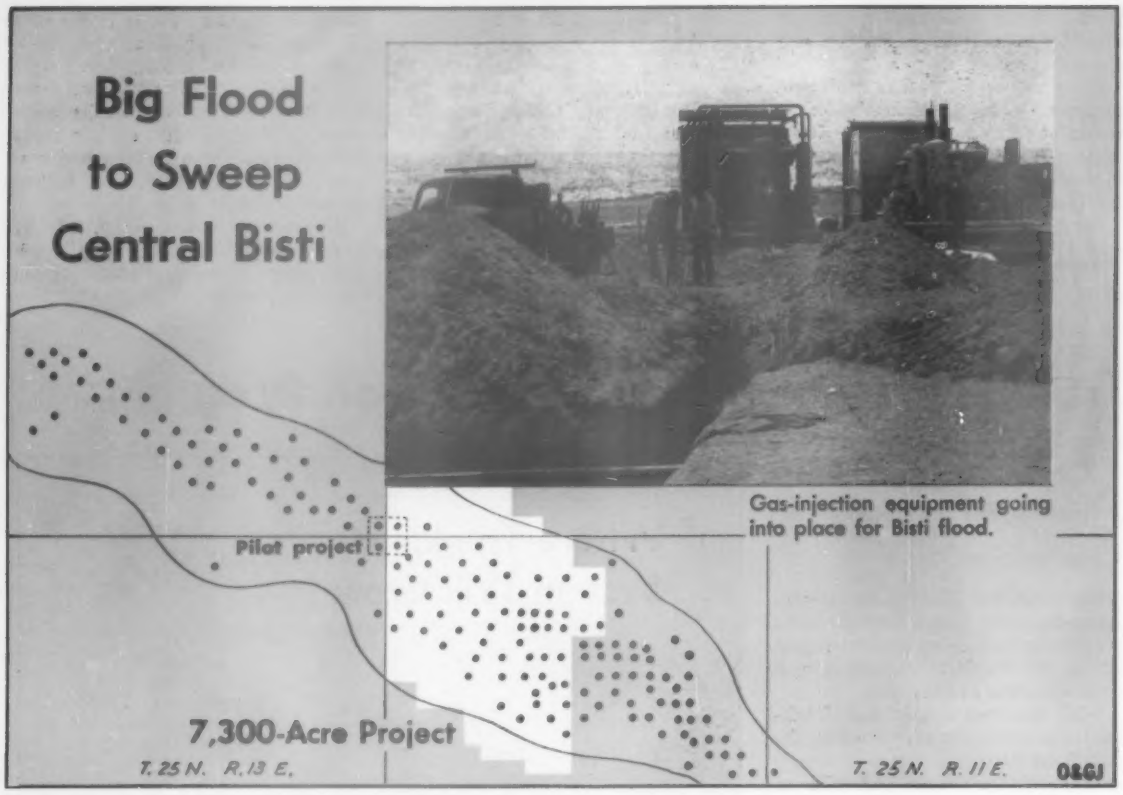
Contracts for new line extension are:

. . . 62.2 miles of 26-in., from Tuscola, Ill., to Rossville, Ill., Contracting & Material Co.

. . . 136.6 miles of 26-in. from Rossville, Ill., to Vistula, Ind. (two spreads), Engineers Limited Pipeline Co.

Connection . . . Trunkline's extension will connect with a 120-mile 26-in. line to be built by Consumers Power Co. from the Indiana-Michigan state line to Plymouth, Mich., near Detroit.

Consumers will take 129,000,000 cu. ft. per day from Trunkline. The remaining 6,000,000 cu. ft. will go to Michigan Gas Utilities Co.



Sunray Kicks Off Big Bisti LPG Flood

• The first flow of a 935,000-bbl. flood of LPG is now being pushed into the pay zone under center of young Bisti field. The expected result: An extra recovery of 6,000,000 bbl. of oil—with most of it profit.

Merle Blakely
District editor

A POWERFUL miscible phase flood to sweep the 4,900-ft. lower Gallup sands in the central unit of Bisti field, San Juan County, New Mexico, has been set in motion.

The unit covers 7,300 acres, 4,700 of which are now productive. There are 63 producing wells in the unit.

Estimated total recovery is 12,000,000 bbl.

Sunray Mid-Continent Oil Co. is the operator. Others in the unit include Phillips Petroleum Co., Shell Oil Co., Amerada Petroleum Corp., Southern Union Gas Co., Pan American Petroleum Corp., and El Paso Natural Gas Co.

The unit is in the center of the huge Bisti field, which has an estimated 200,000,000 bbl. of oil in place. It is the first LPG flood in New Mexico and follows operation of a highly successful pilot flood, which recovered 53% of estimated oil in place.

Operation of the big unit, over its 12-year life span, could point the way for increased recoveries from the entire Bisti field.

Injection of 935,000 bbl. of butanes and propanes has begun. The slug will be completed in November. Injection of 500,000 cu. ft. of gas daily into gas injection wells is under way and this will increase to 20 million later. Two water barriers, to contain the flood and hem in the LPG, gas, and oil will flank the unit on the east and west.

Engineers expect the unit will:

... **Produce** 12,000,000 bbl. of oil, compared to an estimated 6,000,000 under natural depletion.

... **Make a profit** return based on benefit oil to the operators of about $10 for each $1 invested.

... **Spur additional** secondary activities in the northwestern and southeastern areas of the pool.

... **Recover most** of its oil in 8 years, with a 4-year blow-down period to retrieve gases used to propel the flood, plus remnant oil, as a last-gasp bonus.

How it works . . . At present, there are six LPG, five gas, and five water injection wells being activated.

Later, four more LPG wells, three conversions and one to be drilled; four additional gas injection wells, all conversions; and four more water wells, to be drilled, will help vitalize the unit.

Volumes of LPG going into each well will vary from 53,000 bbl. for the thinner sand types of five-spot patterns to 128,000 bbl. for the thicker ones, based on hydrocarbon pore volume. The average hydrocarbon pore volume to be filled with

LPG is 4½%, as dictated by pilot operation experience.

Initially, about 400,000 cu. ft. of gas will be injected into each gas-injection well daily. Injections of water into the water wells will average about 600 bbl. Gas is being injected along the unit's edges where formations are tight and not receptive to LPG because of lower permeability.

There will be two water "fences" serving multiple purposes.

They will be about one mile in length, one along the western boundary of the unit, another on the eastern edge. These will prevent net migration of oil across the unit boundary lines, protect the correlative rights of offset operators, and stimulate secondary recoveries by maintaining reservoir pressures.

There are 63 wells at present in the unit. Several other producing wells will be drilled, to complete the five-spot patterns.

Abundant LPG, gas . . . The LPG will be supplied through El Paso Natural Gas Co. from its Chaco plant, 4 miles north of the unit's compressor station.

The company can supply up to 9,000 bbl. of butanes and propane daily. It is delivered to the field by two 3-in. lines at $2.10 per barrel.

A gas-gathering system, to pick up gas from unit wells for injection use, has been built. It will supply most of the gas needed, although 2 M.M.c.f. of make-up gas will be purchased from El Paso through a 6-in. connection with its 34-in. California line. Heretofore, much of the gas has been flared.

There are 24 miles of gathering lines, 2 to 16 in. in the unit, and 13 tank battery installations for oil and gas separation. Four portable, skid-mounted compressors capable of 1,000 hp., will maintain pressures for injection. British American is supplying most of the water for injection. Unit operators later will drill one water well to the east.

Operation of the unit will be largely automatic, with a field force of less than 10.

Pilot operation . . . Eight months after the field was discovered in December 1955, an LPG miscible-phase pilot project was begun with Sunray Mid-Continent as operator.

It consists of four oil wells located at the corners of a 40-acre tract. The injection well is centered. The pilot test was initiated early in depletion life of the reservoir while pressures still were above the bubble point of 1,207 psi.

In August and September 1957, 31,015 bbl. of LPG and mixtures was injected, followed by a dry gas drive. Original oil in place in the pilot area was estimated at 560,000 bbl. with a primary recovery of only 89,000 bbl.

To June 1, recovery from the four wells had reached 300,000 bbl., or 53% of oil in place. The pilot injection well has been converted to water injection, to maintain sweep efficiency and to form part of the west water barrier. Studies of the pilot behavior will continue.

Participating in the pilot were Sunray Mid-Continent, as operator; British American, Phillips Petroleum, Shell, Amerada, and El Paso. The latter three had no wells in the four-well pilot area but contributed to the operation.

Field history . . . The Bisti discovery well, El Paso State No. 1, was finaled in December, 1955, for 646 bbl. daily from a net pay 13 to 20 ft. in the lower Gallup.

Most wells in the unit were completed in 1956. Potentials ranged from 100 to 700 bbl. daily. The unit area is about 3½ miles long and 2½ miles wide.

Included in the unit are federal, state and Indian lands. Agreements for unit operation have been reached with the Bureau of Indian Affairs, the New Mexico State Land Office, the Department of Interior, the U. S. G. S., and the New Mexico Oil Conservation Commission plus royalty owners and interest holders.

Early stages . . . Production of oil from the Bisti unit has reached 5,000 bbl. daily, but recently it leveled at about 3,700 bbl.

During the 6-month period when the LPG slug is being placed, production will be restricted to 1,250 bbl. daily to build pressure and permit miscibility of the LPG-gas flood.

At first, about 500,000 cu. ft. of field gas will be injected. Later, the total gas injection will reach 20 million cubic feet daily, all but a small part of it coming from Bisti unit wells.

Injection pressures will range from 1,400 to 1,600 psi. Water obtained from a section of the Mesaverde formation at 2,000 ft. will be injected continuously, to maintain the terminal blocks until the blowdown period.

Down the line . . . At present, British American and other companies operating in the west end of the field, adjacent to the central unit, are in process of unitizing.

They are holding operators meetings, and another secondary-recovery project of proportions will be stirring in Bisti in 1960.

Shell's Carson unit is a section of Bisti field immediately east of the central unit. It was organized for development purposes (OGJ, Feb. 23, p. 78).

Nature really rigged an obstacle course in central Bisti's desert-like, trackless terrain.

Vagrant sand dunes, roving at a pace of one-quarter mile a year, forced extra expense in laying gathering lines.

Ruins of an 80-year old stagecoach way-station is a bleak surface sentinel. It gives no hint of the mineral giant coming to life nearly a mile down. Towering, cone-like whirlwinds, "dust devils" to nearby Navajos, spin constantly.

With 3,000,000 bbl. already produced and sold, confident unit operators look for another 9,000,000 bbl. before the lower Gallup in central Bisti is emptied.

Most encouraging is the fact that 6,000,000 bbl. of this additional oil will be crude which would not have been produced by primary means.

Helium Plant Gears

. . . for a reopening with Pan Am delivering gas.

THE BUREAU of Mines will resume operation of the Government's Shiprock, N. M., helium plant about August 1. Helium output will average about 3,500,000 cu. ft. monthly.

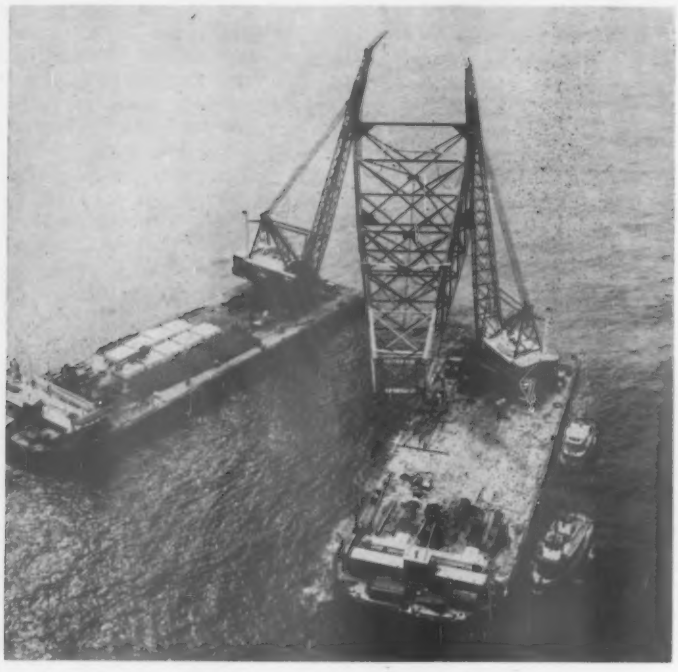
Helium-rich natural gas will be supplied to the plant by Pan American Petroleum Corp. Under terms of a 3-year contract, the bureau will pay 19 cents per M.c.f. for natural gas. Pan American will lay an 8-mile pipeline from one of its new gas wells to supply the processing plant. The natural gas has a helium content of about 5.8%.

The Shiprock installation has been idle since last October because of an inadequate supply of helium-bearing gas in the area.

Anticipated output at Shiprock will represent about one-tenth of the combined production from the Bureau's three plants at Amarillo and Exell, Tex., and Otis, Kans.

A new Government plant, under construction near Keyes, Okla., is scheduled to be completed in August. It is designed to produce about 25,000,000 cu. ft. monthly, or nearly eight times the output of the Shiprock plant.

1. A tug starts the 225-ft. long platform on its tow from Morgan City, La., to the drill site.



2. Two 250-ton derrick barges jockey the platform into position and prepare to set it into the 200-ft. water.

How to Set Up a Tall Platform in Deep Water

PREPARING to drill in the deepest water yet tried off the coast of Louisiana is tricky business.

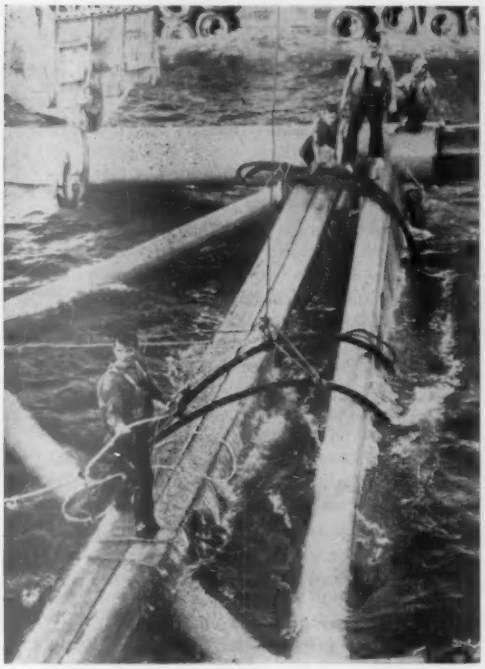
J. Ray McDermott & Co. recently installed a platform in 200 ft. of water for Gulf Oil Corp. The well is 40 miles offshore (OGJ, June 29, p. 54, and May 18, p. 174).

Once the platform was completed, it was loaded on a barge at the Dupont Fabricating Yard on Bayou Boeuf near Morgan City, La., to begin the 40-mile tow to the location in Block 132, South Timbalier area. The drill site is considered part of Block 131 field, but is just inside Block 132.

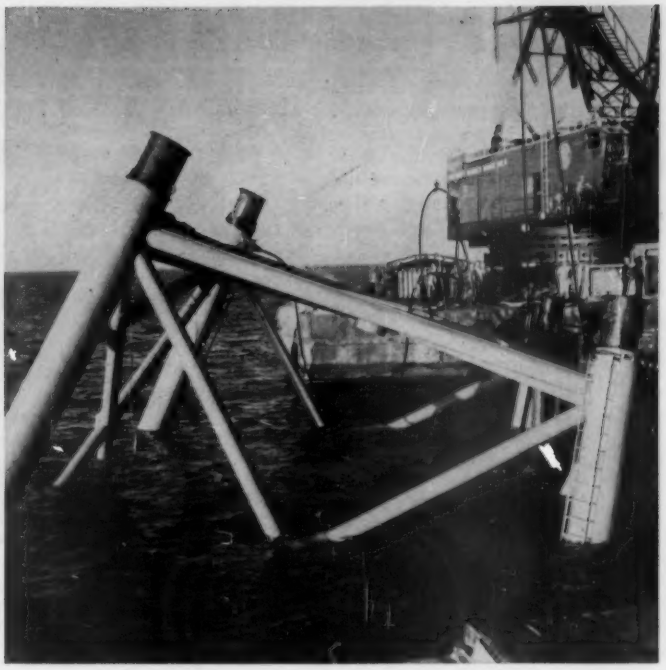
The platform is 225 ft. high. It is 90 ft. square at the bottom and 30 ft. square at the top.

Salt Dome Drilling Co., the drilling contractor, was drilling below 2,350 ft. last week.

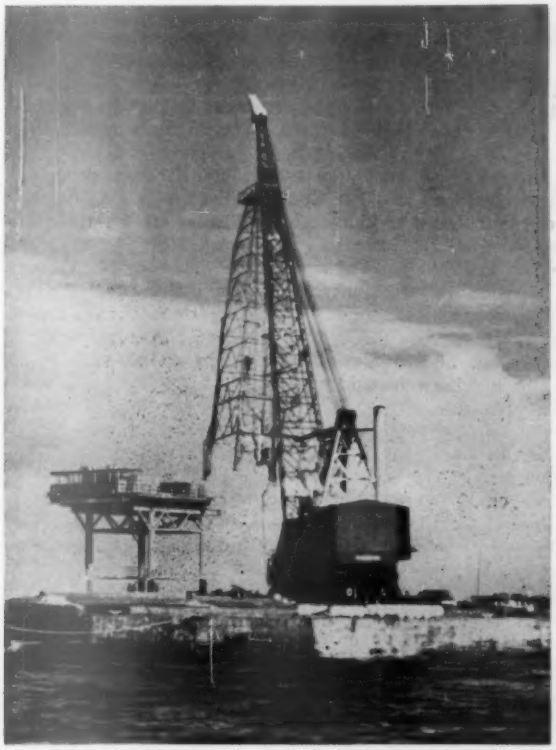
5. Next the draw works and other drilling equipment are set in place on top of the platform.



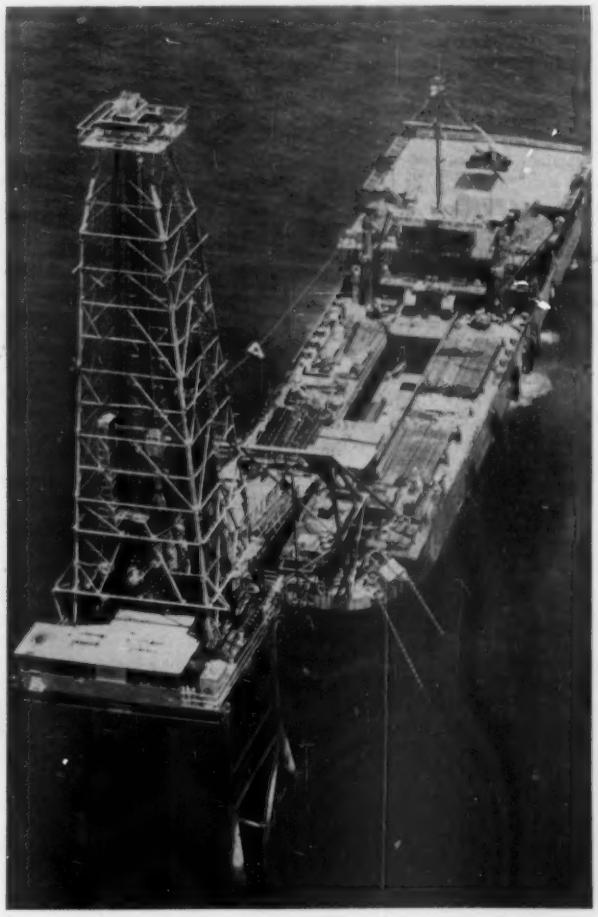
3. Workmen adjust cables before the platform is raised into an upright position.



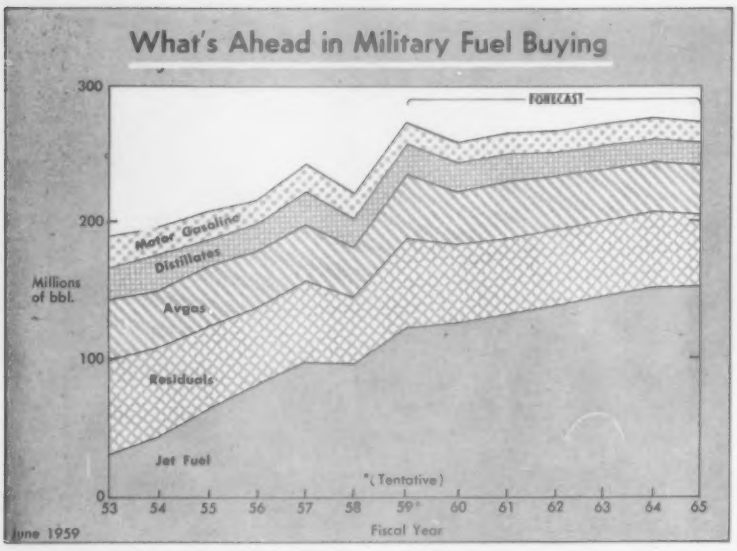
4. The platform settles to the ocean floor. Once upright, piles are driven through the leg jackets to anchor it.



6. The final lift made by the crane is the derrick, which is modified for the National 55 rig.



7. A tender is then added to the scene, and drilling gets under way 40 miles off Louisiana in the deepest water ever tackled by a permanent platform.



Military Predicts Fuel Needs

. . . through 1965 in meeting with WPRA. Big growth will be in jet fuel as use of other fuels tends to level off.

FUELING the military's vast array of equipment will require an increasing volume of jet fuel.

Need for other major fuels will drop in the fiscal year just starting, but demand for jet fuels will be up this year and will keep rising at least through 1965.

This estimate was given the Western Petroleum Refiners Association in Wichita by Rear Adm. O. P. Lattu, executive director of the Military Petroleum Supply Agency.

Lattu said MPSA expects to buy close to 126 million barrels of jet fuel in fiscal 1960 and by 1964 will be buying 151 million barrels.

The over-all jet-fuel increase will be 22.5% from 1959 to 1965. JP-5 will jump 328% during the same period. This is a jet fuel used by the Navy and is relatively small fraction of total military jet needs.

As for the other major petroleum fuels, Lattu said:

. . . **Avgas procurement** will drop to about 40 million barrels in fiscal 1960, which began July 1. It should rise about 3 million barrels in 1961 and then decline steadily to 33 million barrels in 1965 due to continued phaseout of piston aircraft.

. . . . **Motor gasoline** will be down in 1960 to 15.6 million barrels. It should hold at this figure through 1965.

. . . **Distillates** will drop in 1960 to 21.8 million barrels, drop in 1962 to 18 million barrels, and remain at that level through 1965.

. . . **Residuals** will drop in 1960 to 57 million barrels, dropping to 54 million barrels for the 1962-65 period.

The figures represent increases in 1960 estimates for aviation gasoline and motor gasoline, and reductions for jet fuel and residual, compared with forecasts made late last fall by the Petroleum Logistics division of the Office of Assistant Secretary of Defense (OGJ, Oct. 6, p. 103).

Lattu said the military spent an estimated $1.25 billion during the fiscal year just ended for petroleum products.

To emphasize the volumes of fuels used, Lattu gave these figures:

Modern jet planes gulp from 900 to 3,000 gal. of fuel per hour. It takes five 5,000-gal. tank trucks to fill the tanks of a single large jet bomber.

The newest operational Army tank requires 600 gal. of gasoline to travel 100 miles. And it takes 2,100 gal. of fuel to move one armored division a mile.

A Forrestal class aircraft carrier loads for a voyage 2,000,000 gal. of fuel oil, plus an additional 1,000,000 gal. of aviation fuel.

MPSA is responsible for procurement of products for the world-wide military machine and for coordinating distribution of the supply to the overseas commands.

Subsurface Rights

. . . can be kept by Colorado counties in tax sales, but high court is critical.

THE RIGHT of Colorado's 63 counties to retain mineral rights to land they sell for delinquent taxes has been upheld with reservations by the Colorado Supreme Court.

The tribunal ruled such procedures legal but ordered the counties to sell the rights as quickly as possible in order to get the property on the tax rolls.

The decision came in a lawsuit filed against Weld County by Frank Farnik, who paid $800 for a half-section of land in the county at a tax sale in 1943.

Weld County retained the mineral rights and deeded to Farnik only the surface rights. Later, the county leased the mineral rights to private operators and so far has gained more than $25,000 in revenues from the lease rentals and royalties on oil and gas production.

Sales Urged . . . The Supreme Court said Weld County should restore its retained mineral rights and "forego its ill-gotten royalties in rentals from lands that should be privately owned."

The high court opinion upheld a ruling by Judge Dale E. Shannon in District Court at Greeley, Colo., but severely criticized some of his findings.

"The county does not have blanket authority to deal in real estate," the Supreme Court opinion stated.

"All county-owned property not needed for use of the county should be sold promptly."

Regular Gas Quality Up

REGULAR GASOLINE continued to gain in quality in June while premium remained unchanged, according to the monthly Ethyl Corp. survey of motor-fuel quality.

The nationwide average for regular rose one-tenth of an octane number last month to 91.9 Research, while premium stayed at 99.1.

Most of last month's large gains were in the Rocky Mountain and West Coast areas, ranging from 0.5 in Denver and Los Angeles to 1.1 octanes in Portland, Ore.

Despite the June gains, average regular quality on the West Coast was still below the national average, while the average quality of premium failed to gain in June.

New Insurance Plan

. . . is offered by Texaco in New Jersey plants. Plan gives workers treatment at home as well as in the hospital.

TEXACO became the first oil company to make the so-called "home care" health insurance plan available to its employes when workers at its Bayonne marine terminal and Linden and Little Ferry, N. J., bulk plants signed up last week.

The contract, effective July 1, is between Texaco and the Federal Life Insurance Co. Its principal features are lower cost and greater benefits than many company plans now in effect (OGJ, Sept. 23, 1957, p. 72).

Both the lower costs and greater benefits result from recognition that invalids frequently react better to treatment at home than in hospitals. Since much costly hospital residence is avoided, the lower charges and wider benefits are possible.

Some of the benefits include:

. . . **Employes** may continue the plan after retirement.

. . . **Provision** is made for psychiatric treatment.

. . . **Dependent children** up to the age of 23 are covered and, in certain cases, are covered indefinitely.

Total cost on a monthly basis is $4.70 for a single employe, $10.36 for an employe with one dependent and $14.25 for an employe with two or more dependents. Texaco pays $1.32 of the single employe's costs and $2.82 for those with one or more dependents. This makes the cost to the employe $3.38 for a single person, $7.54 for an employe with one dependent and $11.43 per month for those with two or more dependents.

These rates compare with a low of $5.07 and a high of $7.25 for a single employe and a low of $14.33 and a high of $20.45 for family coverage which have been made available to Texaco at other points.

The home-care or O'Leary plan is backed by the Oil, Chemical, and Atomic Workers Union. The Texaco Nation-Wide Council, headed by J. Elro Brown, OCAW official in Houston, also has given the plan its sanction.

Rates given by Federal Life are based on ultimate acceptance of the plan by 14,000 workers. The number covered by the initial signing is only a few hundred, but the insurance company is confident that the 14,000 minimum will be reached quickly.

Highlights . . . Here are highlights of the plan as described in folders being sent to each registrant at the three Texaco installations:

. . . **The plan will pay** up to $15,000 with respect to each insured person.

. . . **It will pay 100%** of semiprivate room charges for 10 days and 80% thereafter; 100% of first $500 of miscellaneous hospital services and 80% thereafter; and 100% of charges under home care for 10 days and 80% thereafter, not exceeding $6.50 per day.

. . . **Surgeon's fees** up to $300 and 80% thereafter are covered.

. . . **X-ray, laboratory** and ambulance services up to $100 per year are paid.

. . . **It pays 50% of expense** incurred for psychiatric treatment not to exceed $20 per treatment nor 50 treatments per year.

. . . **It covers** the employe's spouse, unmarried children under 19, children to 23 if dependent on employe for one-half of their support and children over 23 if mentally or physically incapable of self-support.

Texaco's portion of the total charge would be taken over by the employe on retirement but otherwise all conditions of the original contract would remain in effect.

Cost of Texaco Health Insurance

	Total monthly premium	Texaco contribution	Employe contribution
Single employe	$4.70	$1.32	$3.38
Employe with one dependent	10.36	2.82	7.54
Employe with two or more dependents	14.25	2.82	11.43

the JOURNAL *said . . .*

50 years ago

July 6, 1909

Two wildcat tests being started by Baton Rouge Oil & Natural Gas Co. and Tucker Co. near Deerfield, La., 17 miles northeast of Baton Rouge, in East Baton Rouge Parish, will probe mysteries of a long-puzzling 7-mile-long string of large sand mounds.

Prairie Oil & Gas Co. revises Oklahoma-Kansas crude-oil grades in first price change since March 9, 1907. New schedule replaces six gravity classifications with two grades, posting 38 cents for crude 30° gravity and above and 28 cents for below 30°-gravity crude. Former prices ranged from 28 cents for crude below 29° gravity, to 41 cents for 38° gravity and above.

Associated Oil Co. reverses previously announced non-development policy to start 10 strings of tools on its Wolverine lease at Kern River in Kern County, California. Action attributed to impending break with independent producers and need to develop own oil production to replace lost connections.

25 years ago

July 5, 1934

First 136-ft. derrick on Gulf Coast is set up by Pure Oil Co. to drill its 2 Stewart well in Louise field, Wharton County, Texas. Biggest derricks now used in Gulf deep drilling are 122-ft. high.

Completion during week of 11 oil wells with initial daily flow of 28,872 bbl. sets new record for Michigan as drilling activity in state continues to step up.

Quintana Petroleum Co. and Humble Oil & Refining Co. 1 Tom O'Connor, wildcat well 8 miles northeast of Refugio, in Refugio County, Texas Gulf Coast, comes in with flow of 1,000 bbl. of oil daily from sand at 5,555-75 ft. Major discovery (Tom O'Connor field) is indicated.

HEADLINES: New oil-marketing pact improves Pacific Coast outlook. . . . New Hobbs, N. Mex., gusher flows 17,625 bbl. of oil in 24 hours. . . . Repressuring proves successful in Panhandle (Texas) field. . . . Refiners produce 2½ million tons of asphalt annually.

10 years ago

July 7, 1949

Canadian-backed American Gas Transit Corp., Ltd., reveals plans for 1,300-mile 30-in. natural gas line from southern Louisiana to northeastern states.

Salt Lake Pipe Line Co., subsidiary of Standard Oil Co. of California, asks bids on construction of initial portion of 560-mile oil-products pipeline from Standard's new refinery at Salt Lake City into the northeastern states.

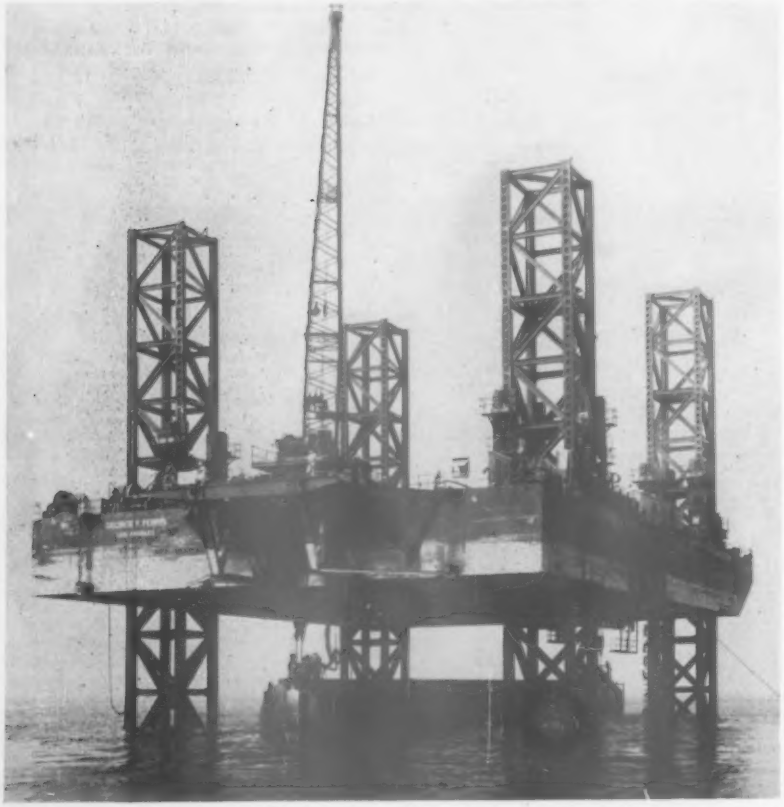
Montana-Dakota Utilities Co. proposes 340-mile 12¾-in. gas line from Worland field, Wyoming, to company's Cabin Creek compressor station in Fallon County, Montana, where it will make available additional 35,000 M.c.f. of gas daily to customers in Montana, North Dakota, and South Dakota.

HEADLINES: Domestic opposition continues on proposed Mexican oil loan. . . . Phillips completes second well in its newly discovered B-1 field in eastern Venezuela. . . . Tidelands again stalemated as Krug rejects compromise plan.

PHOTOS IN THE NEWS

A Pipeline for Cars?

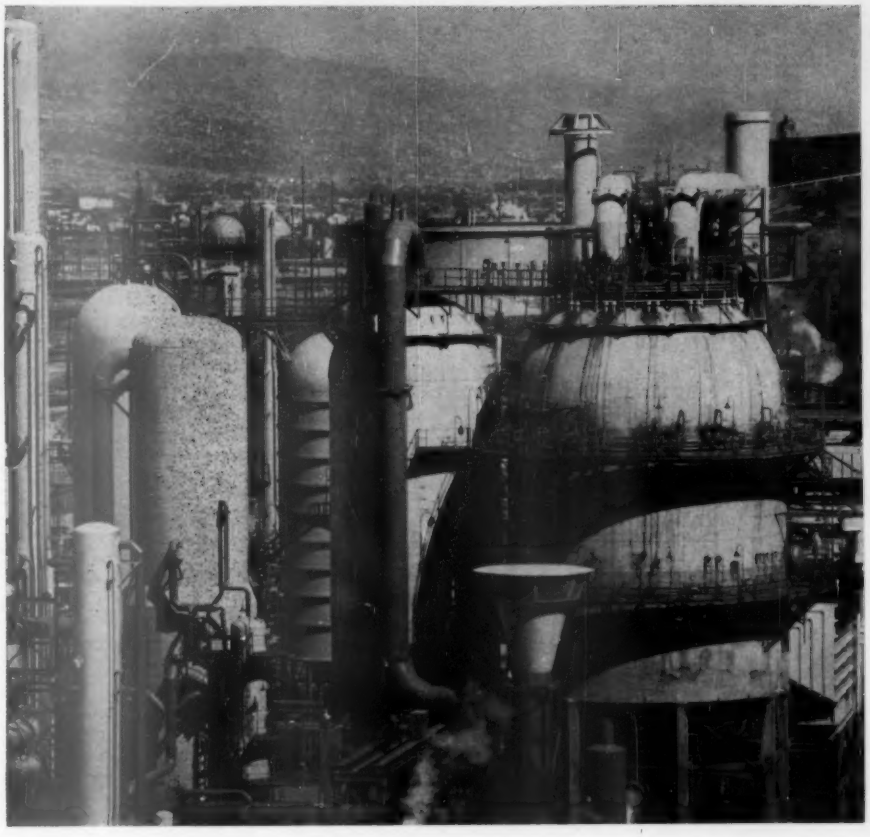
No, this line wasn't built to haul cars, although its 94-in. diameter—almost 8 ft.—is spacious enough to accommodate this French-made Peugot 403. And an auto pipeline isn't as far fetched as a recently proposed submarine pipeline (not an underwater line, but a fresh-water line through which submarines could travel from the Gulf of Mexico to the Great Lakes). Actually, the pipe holding the car is going into a low-pressure gas line at the Belleville, France, plant of Pont-a-Mousson, maker of the pipe. The 94-in. line probably is the biggest gas line in the world.



Big Platform Wades Into Deep Water

The George F. Ferris, world's biggest mobile platform, is nearing the halfway mark in its pipelaying project off El Segundo, Calif., before being converted to drilling operations. The platform recently passed the water-depth record for a mobile platform and is currently working in about 160 ft. of water several miles off California. Before it completes the sewer project, it will operate in depths up to 200 ft.

The platform is being operated by Hypersion Constructors, a joint venture of Raymond International, Inc.; Delong Corp.; Healy Tibbits Construction Co.; Peter Kiewit Sons' Co.; Macco Corp.; and Tavares Construction Co. The unit is named for George F. Ferris, Raymond International's president.



Cracker Built in Record Time

A product upgrading expansion at Standard of California's Richmond refinery on San Francisco Bay was completed in less than a year.

Principal addition to the plant was this 55,000-bbl. fluid catalytic cracking unit. In order to reduce air pollution, a 300,000-lb. per hour carbon-monoxide boiler was included in the cat cracker. The expansion also included an alkylation unit and an isomerization unit. The 2,000-bbl. isomerization unit uses the Butamer process and is the first of its type built. Isobutane produced is charged to the 4,500-bbl. alky unit.

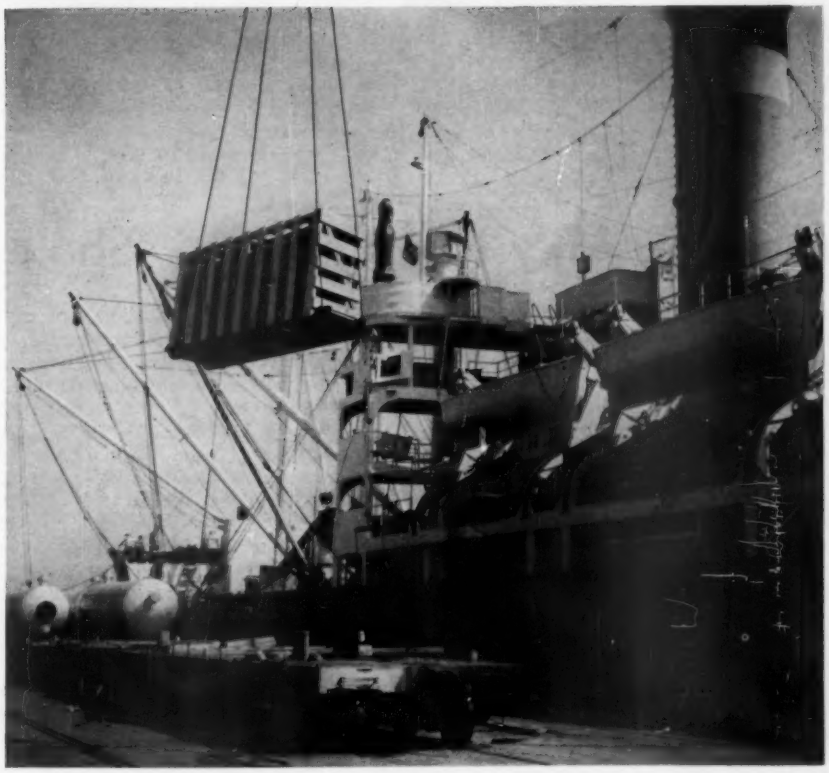
The expansion will increase the refinery's yield of high-octane gasoline 20,000 bbl. daily and cut heavy fuel oil output a similar amount.

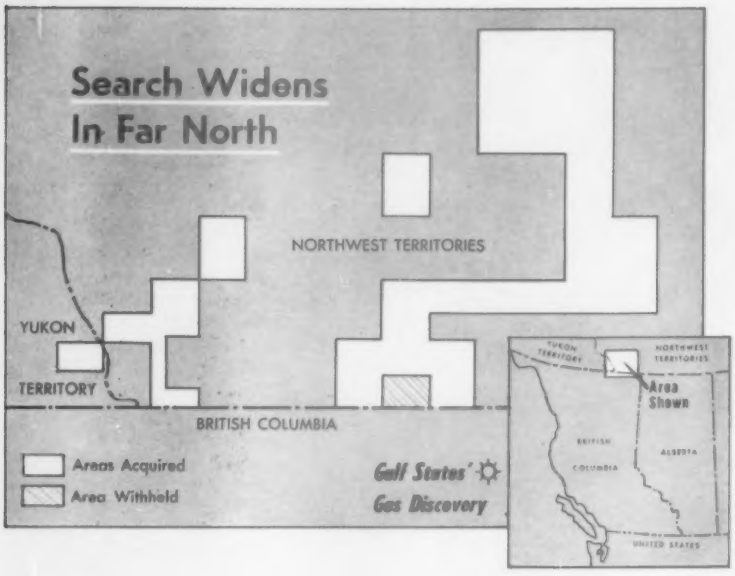
Sight-seers will get their money's worth out of the big cat cracker. It is pastel colored.

Drilling Equipment Heads for Argentina

Tennessee Gas Transmission is moving men and equipment in Tierra del Fuego off the southern coast of Argentina to step up its drilling program under a newly acquired drilling contract from the Argentine Government.

A shipload of equipment left Houston recently bound for Ushuaia, a port on Tierra del Fuego, which is an island about 125 miles northwest of Cape Horn. This equipment will supplement equipment TGT already is using on the island. This earlier equipment is owned by Laughlin Porter Drilling Co., which relinquished its contract for the Tierra del Fuego drilling. TGT has a contract to drill on about 3.5 million acres on the island.





Tests Planned on Huge Block

. . . in Canada by Home Oil Co., operator for group. First wildcat will be on North Petitot when freezeup permits.

A FIVE-COMPANY group is acquiring a 50% interest on 1,224,000 acres of untested Canadian oil and gas lands in Northwest Territories.

Home Oil Co., Signal Oil & Gas Co., Kern County Land Co., Alminex Ltd., and United Oils Ltd. will pay $3.5 million and drill five wells on acreage held by Canada Southern, Magellan Petroleum Corp. and Oil Investments Inc.

The agreement calls for an additional investment of at least $3 million in drilling and exploration work over the next 5 years. The group was after rights on North Petitot structure, a feature covering about 160,000 acres, or 250 sq. miles.

Canada Southern says recent seismic surveys indicate the subsurface structure is the largest ever mapped east of the mountain fronts of Western Canada. Eighty to 90% of the structure lies on company acreage.

There is evidence that major reefing is present in two or more horizons over a large area of the properties, including the North Petitot feature. A major gas discovery by Gulf States at Petitot River, 16 miles southeast in British Columbia, further enhanced the area, and 16 companies entered negotiations with Canada Southern on its lands to the north.

Winter drilling . . . Home oil, as operator, plans to use two seimic crews and drill two, or possibly three, wells this winter.

The first test will be on North Petitot as soon as the freezeup permits the movement of heavy drilling equipment, probably in November.

A commercial gas discovery at North Petitot would probably be tied into the West Coast Transmission system. An extension of the system from the Blueberry area to Fort Nelson is now under construction. Unconfirmed word from Canada last week was that a feeder had been approved from Fort Nelson to Petitot River.

The Canada Southern group is receiving partial payment of $1.5 million with the closing of the deal. The $2 million balance will be paid in three equal installments during the next 3 years.

The purchasing group also has an option to acquire 50% interest in an additional 31,996-acre tract on North Petitot structure, which Canada Southern and its partners are retaining.

Canada Southern held 75% interest in the properties, while its partners, Magellan and Oil Investments each held 12½%.

Meeting May Iron Out U. S. Shale Blast Plan

THE FEDERAL Government is seeking an early decision from oil and chemical companies on its plan for a joint experiment to produce shale oil from an underground nuclear explosion.

A second meeting to discuss the proposal with industry leaders is expected to be scheduled soon by the Interior Department's Bureau of Mines and the Atomic Energy Commission.

Marling J. Ankeny, Bureau of Mines director, said the meeting is being considered in view of the industry's "generally favorable" attitude toward the experiment.

Twenty-one petroleum and chemical firms have responded to a Government poll seeking their opinions on the experiment. "All but two of these respondents indicated that the project should be conducted," Ankeny said, "and several expressed willingness to participate and help finance at least part of the project."

As envisioned by the two Government agencies, shale broken by the underground explosion would be retorted in place to produce oil.

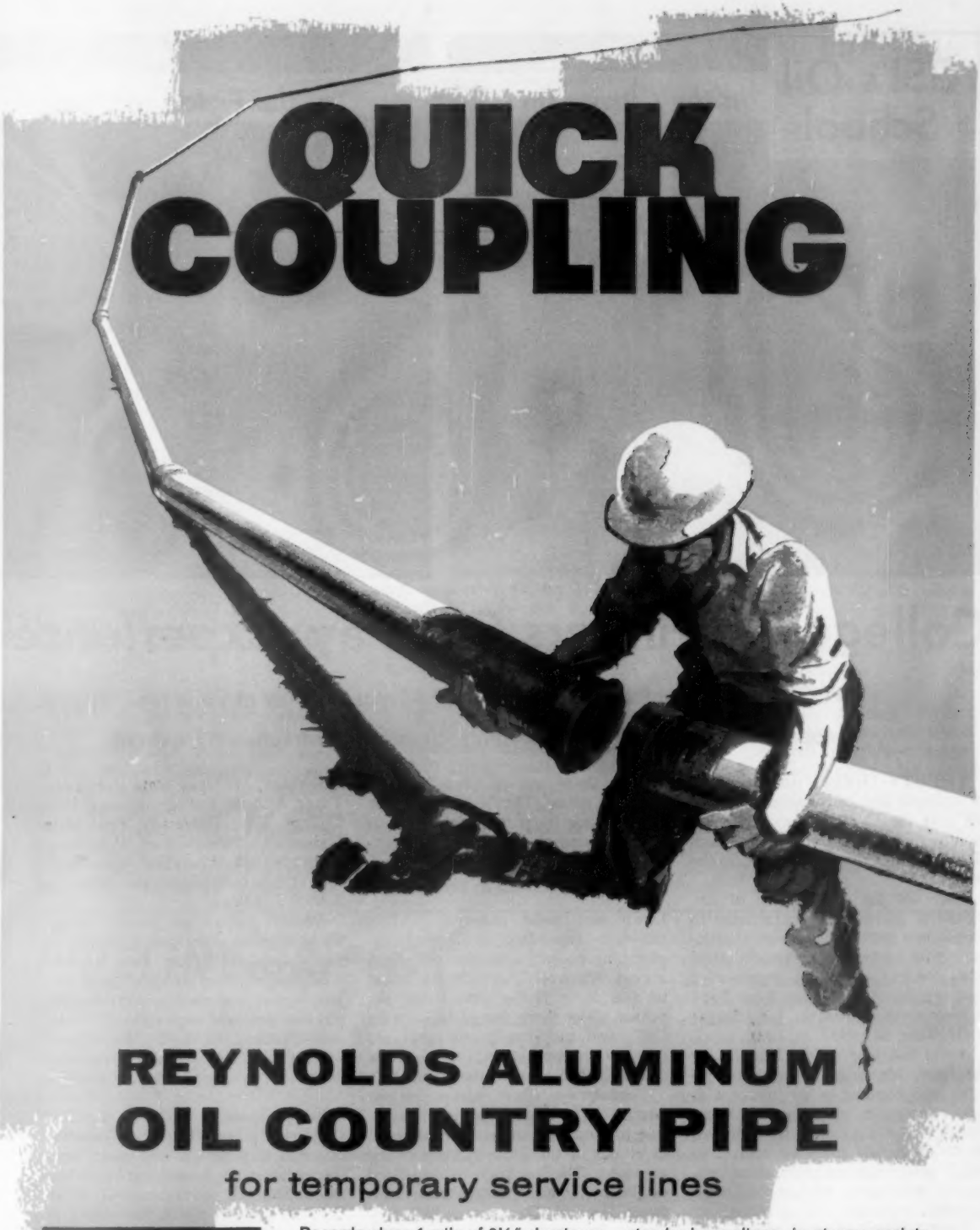
Cost tabs vary . . . The Bureau of Mines and AEC have suggested the Naval Oil Shale Reserve near Rifle, Colo., as the test site. Details of the proposal were explained to industry representatives at a Dallas meeting last winter (OGJ, Jan. 12, p. 58).

Cost of such an experiment has been estimated at about $2,600,000. Of that sum, private industry would be expected to pay about $1,200,000.

Since the Dallas meeting, several critics have warned that the project is not feasible because of the dangers of radioactivity and the likelihood that it would produce no commercial oil. One atomic expert has estimated cost of the experiment as high as $10 or $15 million.

Government officials now propose to offer industry a cooperative agreement covering only detonation of the nuclear device and the work necessary to evaluate the effect of the explosion.

This proposal, Ankeny explained, would recognize industry's view that any cooperative agreements concerning in-situ recovery phase of the experiment should await full assessment of the nuclear phase.



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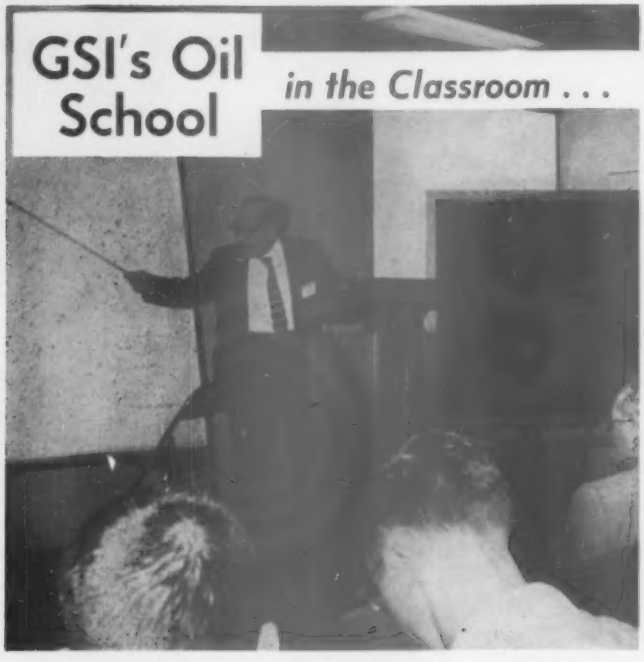

College Oil Finders Get Pay, Experience

• Collegians learn exploration ropes and make money at same time. Actual geophysical field work supplements classroom instruction by experts.

TWENTY-THREE students from 19 colleges and universities scattered out over the U. S. oil patch late last month to start getting their hands dirty with oil exploration crews in the field.

They are the ninth group of collegians to get the rare opportunity to supplement routine classroom instruction with actual geophysical field work under a student cooperative plan sponsored each year since 1951 by Geophysical Service, Inc., Dallas (OGJ, June 24, 1957, p. 102).

Again this year, before heading for the field, the crop of selected students was exposed to an intensive 4-day orientation program in Dallas. During the 4 days, they were briefed by 45 specialists from 10 companies and 2 universities on exploration techniques, equipment, philosophy, management, research, and personnel.

They listened to and mingled with a large sample of the best exploration brains in the country—including company presidents, research managers, a board chairman, chief and division geologists, geophysicists, instrument engineers, and exploration managers.

For the rest of the summer they will work in rotation in the field with GSI recording shooting, survey, and drilling units and spend a hitch in the field office. They'll be graded on performance by party chiefs and the grades passed on to each firm participating in the program and each college represented.

Learn and make money . . . This thorough grounding in applied exploration doesn't cost the collegians a cent. It's free. The tabs for travel to and from Dallas plus living expenses while there are picked up by GSI. And the plan participants are paid on the regular pay scale while in the field the rest of the summer.

Furthermore, there are no strings attached. The student participants are free to work for anyone they choose, in or out of the industry, when they graduate. The program materialized originally from a "bull session" between Cecil H. Green, now honorary board chairman of GSI, and Prof. Robert R. Schrock of Massachusetts Institute of Technology. The first year all students came from MIT. Since then, participants have come from all over the U. S.

Schools represented by students this year include: MIT, Kansas University, Lamar Tech, Colorado School of Mines, Lehigh University, Oklahoma University, Michigan State University, Texas A & M College, Kansas State College, Tulsa University, Penn State University, University of Minnesota, University of Wisconsin, Rice Institute, Utah University, and Montana School of Mines.

Student majors are diverse though all in sciences contributing heavily to exploration. This year they include: Electrical engineering, geological and geophysical engineering, physics, geophysics, geology, engineering physics, mathematics, and mathematical engineering. Sixteen are third-year students, the rest graduate students.

What do sponsors get? . . . Lending GSI a hefty assist in putting over the orientation program this year were top exploration personnel from Atlantic Refining Co., Arabian American Oil Co., Humble Oil & Refining Co., Magnolia Petroleum Co., Shell Development Co., Sinclair Oil & Gas Co., Standard Oil Co. of Texas, Texaco, Inc., and Texas Instruments, Inc. Helping out also were professors from Southern Methodist University and Texas A & M.

GSI spends something over $5,000 in direct costs annually on the program. And the oil companies contrib-

...and the Results...

Where Students Go	No.	%
Still in school	44	28.21
Petroleum Industry	61	39.10
Geologists	(22)	
Geophysicists	(34)	
Other	(5)	
Allied Business	1	.64
Research	8	5.13
Teaching	7	4.49
Military	6	3.85
Mining	4	2.56
Other Businesses	9	5.77
U. S. Government	3	1.92
Soil Engineers	3	1.92
Deceased	1	.64
Failed to Respond	9	5.77
TOTAL	156	100.00

Plus Teaching

ute priceless talent which could be working on projects more directly fruitful. What do they get in return?

GSI, of course, hopes that some of these top-notch college science majors will come back to start careers with the company after graduation. The oil companies are hoping the same thing.

But both have bigger, broader motives. They want to attract the highest type of student into the oil business. They figure they can do that to best advantage by showing the youngsters for the first time the tremendous variety of jobs oil offers them and the first-rate talent it employs.

It is a subtle way of advertising for the future.

As one GSI executive puts it: "Too, we feel that our company stands to benefit from anything that benefits the industry as a whole. Many of these young people are going to take industry jobs. And on the purely selfish side—some day soon they'll be in the market for our services."

Facts bear out hopes . . . Recently, GSI undertook to find out just how effective the program had been during its first 8 years via a check into where plan graduates are now working.

Results bore pleasant testimony to the plan's success.

Of the total 156 students completing the plan through 1958, 112 have now completed college work and embarked on careers. Of the 112, more than half (61) now are working in the petroleum industry. They include 22 geologists, 34 geophysicists, and 5 other exploration specialists.

Of the remainder, 8 are in research, 7 in teaching, 6 in the military, 4 in mining, 9 in other businesses not related to the oil industry, 1 in business allied to the industry, 3 in government, and 3 soil engineers.

And GSI has fared well, too, in recruiting college graduates who've completed the plan. Of the 34 geophysicists going into the industry, 20 have returned to GSI.

Texas to Intervene

. . . in FPC favored-nation study if petition approved.

THE STATE of Texas has asked permission to intervene in Federal Power Commission hearings in Washington over the validity of favored-nation clauses in gas-purchase contracts.

FPC currently is questioning the legality of such clauses in hearings on Pure Oil Co. contracts which contain them.

Such clauses require the pipeline purchaser to hike the price paid producers already under contract when the pipeline negotiates a higher price with another producer in the same area. Permission for Texas to intervene was sought by Will Wilson, state attorney general, last week.

Clauses questioned . . . Wilson said Texas is threatened with a future loss of more than $1,500,000 a year if such clauses are held illegal. FPC has not challenged the "reasonableness" of the gas price received by producers under these contracts — just the clauses, Wilson said.

"We take the position," Wilson said, "that the gas producers should not be required to refund money which the pipeline companies agreed to pay for the gas." The Texas attorney general held in an opinion nearly a year ago that Texas must give back taxes on gas price rises if producers are forced to make refunds.

PIPELINE BRIEFS . . .

An LPG line has been laid by El Paso Natural Gas from Aneth, Utah, to Chaco in northwestern New Mexico. R. H. Fulton had the contract on the 97-mile 7-in. line.

Three pump stations on Humble Pipe Line system are being converted from diesel or gas engine to electric. The 3,500-hp. Kemper station and the 5,000-hp. Satsuma station on the crude line will be completed January 1, 1960. The conversion of the 300-hp. London station on a butane line will be completed August 1. Company forces are handling the work.

A 279-mile 6-in. extension of the Kaneb products line in Kansas, Nebraska, and South Dakota has been contracted to Williams Brothers Co., Tulsa, under direction of Supt. G. R. Hamilton. The line will be built in two parts—111 miles from Phillipsburg, Kans., to Fairmont, Neb., and 168 miles from there to Yankton, S. D. Construction is getting under way this week and will be completed early in the fall.

Some 907 miles of natural-gas line will be laid by El Paso Natural during 1959. The company laid 352 miles of line during the first 6 months and expects to lay 555 miles during the rest of the year.

A 32-mile 4 and 6-in. gathering-line extension program has been completed by Producers Pipelines, Ltd., in Saskatchewan. The crude-oil system plans further expansion of 60 miles of 4 and 6-in. this fall to connect new leases.

Also for Pipeliners...

IN THE NEWS: Transwestern's plans for a 1,809-mile line from Texas to California at a cost of $191,700,000 are approved by an FPC examiner. Full commission will hear oral arguments July 14 (p. 70) . . . Trunkline lets contracts to 11 firms for $81,500,000 expansion program (p. 71).

PLUS THESE TECHNICAL REPORTS: How to save money by cooling gas between compressor stages by direct contact with water (p. 96) . . . and how Mid-Continent Pipe Line makes machine parts last longer by plating (p. 136).

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Smogless Car Proposed to Fight Smog

- **Union Oil says changes in auto fuel system cut hydrocarbon losses.**

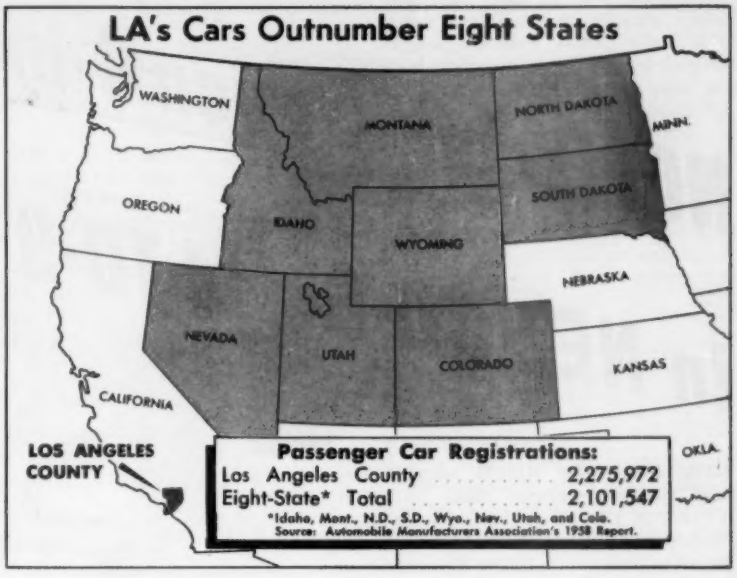
ONE of California's refiners, under pressure to produce a smogless gasoline, is proposing a new anti-smog weapon—a smogless automobile.

A spokesman for Union Oil Co. of California says preliminary studies show that simple modification of the auto fuel system could reduce carburetor and gas-tank evaporation losses from 90 to 95%.

This would mean a reduction of up to 310 tons of hydrocarbon losses to the air in Los Angeles on hot days. It would eliminate 20 to 30% of all hydrocarbon losses from cars in Los Angeles daily.

Union says a practical afterburner would then take care of remaining evaporation or carbon monoxide losses.

This new approach to Los Angeles' critical smog problem was outlined at the fifty second annual meeting of the Air Pollution Control Association in Los Angeles by Fred L. Hartley, vice president of Union.



Five openings . . . Five points of evaporation or carbon monoxide losses from cars were covered in Union's experiments. Hartley cited these results:

. . . **External carburetor vents** in six autos were plugged. After months of operation under all sorts of conditions, no interference with normal operation was noted. Studies showed 5% of total fuel consumed during idle operations was lost by evaporation through opened external vents. Union's conclusion is that the vents are unnecessary.

. . . **"Hot soak" losses.** This is the condition where gasoline in the carburetor bowl evaporates and escapes through the internal vents and out the air intake. Union solved this problem with a vacuum-operated system for draining the bowl as soon as the engine is turned off. In order to assure quick restarting, electric fuel pumps were used. "Hot soak" losses, which amount to about 40% of all fuel-system losses from cars in Los Angeles, were cut by 95% through this Union modification.

. . . **Fuel-tank vents.** This problem was tackled from two angles. First, Union installed a ½-in. thick insulation around the gas tank. This consisted of two layers of asbestos paper, a sheet of aluminum foil, and a final layer of asbestos cloth. This reduced the tank temperature by 13° F. and cut evaporation losses by 70%.

The second step involved plugging the fuel-tank vent with a vacuum-actuated valve during engine operation when the vast majority of evaporation occurs. Combination of the two modifications cut fuel-tank losses by 90%.

To solve the problem of pressure build-up and partial vacuum resulting from the modifications, a gas cap was used to act as both a pop-off valve for pressure build-up and a vacuum breaker when air was needed. Union used the standard Chevrolet Corvette cap to do this job.

Other problems such as tank pressure against the drain-back carburetor system and excess fuel-pump pressure from the pressurized gas tank were similarly solved by simple modifications, Hartley reported.

Afterburner . . . An efficient afterburner designed to burn hydrocarbons, carbon monoxide, and oxides of nitrogen would solve losses from crankcase vents and clean up exhaust gases, Hartley told the meeting.

Hartley's paper, prepared also by C. C. Moore and J. B. Gregory of Union, summed up the company's findings on an encouraging note to motorists. Union's redesigned fuel system resulted in a 1 to 3% increase in gasoline mileage by reducing evaporation losses.

Afterburner developments . . . Also at the meeting, Thompson Ramo Wooldridge, Inc., took the wraps off a prototype afterburner capable of removing 90% of unburned hydrocarbons from car exhausts. It also will remove 90% of carbon monoxide exhaust emissions.

Thompson Ramo Wooldridge and Chrysler Corp. announced a joint project to design a simpler, more compact unit and put it into production.

The afterburner, developed by the Ramo-Wooldridge division of the company, acts also as a muffler. It operates by pumping air into the exhaust and heating the mixture to the point where complete combustion occurs. The cleaned and cooled exhaust is discharged in the normal manner.

At its present stage of development, the afterburner is slightly larger than a car muffler but in operation, it would replace the muffler as well as perform its main function.

Car builders hit . . . A sour note was struck when two speakers at the smog conference blasted the auto industry's failure to participate in the meeting.

Smith Griswold, chief of the Los Angeles County Air Pollution Control District, and Warren Dorn, Los Angeles County Supervisor, both lashed the car makers for withdrawing from the gathering.

Griswold said the auto makers withdrew from the APCA convention because "they did not care to come to Los Angeles where they are unfairly criticized."

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New job-getting efficiency! Both the new TD-6 and TD-9 Four-in-One's have increased track length, for new tough-job stability and flotation. Both are geared with new speeds for greater tough-job capacity. Both have the power-transfer efficiency of new full-face, sintered metal engine clutches.

And both the new TD-6 and TD-9 have exclusive vented track-roller and idler shafts, assuring positive seal protection from over-lubrication. Big 300%-increased lube capacity shells provide 500-hr. track-roller greasing intervals!

Move the selector lever! Prove versatility unlimited of exclusive 4-in-1 as Skid-Shovel; space-saving, bottom-dumping clamshell; full-sized bulldozer; inch-close-accurate "carry-type scraper." Add up how many tens of thousands of dollars a new TD-6 or TD-9 four-in-one can save you, doubling for one limited-duty rig after another! Measure the plus value of exclusive shock-swallowing Hydro-Spring. See your International Drott Distributor for a demonstration!

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Military Needs Purer Products

. . . because of critical requirements of today's engines, Horwath tells refiners. Big problems are contamination, moisture, and sludging in storage.

CLEANER FUELS and lubricants are required by the armed forces today than were acceptable in years past.

Today's high-flying supersonic aircraft have had many problems as a result of moisture in jet fuels, corrosion and sludging of fuel in storage, and contamination of aircraft products during blending and canning.

The problem of water and solid particles in aviation gasoline for piston engines isn't new, R. J. Horwath, of the Military Petroleum Supply Agency, told the Western Petroleum Refiners Association meeting in Wichita. But the new jet engines pose more critical requirements.

Jets use enormous quantities of fuel. Faster flow rates and higher fuel pressures are required. This demands closer tolerances in the fuel-control system and a cleaner fuel.

Water may be present in jet fuel in the dissolved state, or as free or entrained (emulsified) water.

In removing the water, MPSA has bumped into one problem. Some corrosion inhibitors added to the fuel reduce the efficiency of separators extracting the water. And certain inhibitors have an effect on thermal stability of jet fuel. The agency therefore is asking all jet-fuel suppliers not to add inhibitors to future deliveries.

An exception is made only where the fuel is to move by pipeline and the pipeline company must add the inhibitor to protect its line.

S. W. Downer, of Consolidated Electrodynamics Corp., told the WPRA his firm now has an instrument for continuous monitoring of moisture in jet fuel. The method is based on complete electrolysis of the water.

Storage problem . . . Corrosion and sludging in storage is another problem.

Avgas and jet fuels often are contaminated by contact with polluted water in tank bottoms. This occurs by introducing water containing corrosive sulfur compounds, or by the action of sulfate-reducing bacteria.

Last year, the WPRA was told, the Air Force had malfunctions in refueling equipment in its KC-97 tankers and also in fuel systems of B-47 bombers.

These were caused by sludge deposits in JP-4 fuel bulk storage tanks and in underground storage at the air bases. Bacteria were found to be the primary cause of sludging. Eleven of 18 bacteria types tested were found able to use JP-4 as essential nutritive material. Several gum and corrosion inhibitors were unsatisfactory in combatting the bacteria. In fact, the Air Force found that some bacteria which could not survive on JP-4 thrived on the additives.

Sodium and potassium tetraborate are now being tested in controlling the bacteria and early results are promising.

Contamination . . . Contamination of hydraulic fluids, synthetic jet engine oil, compass and instrument oils, and other products is becoming an increasing problem.

This contamination comes, the WPRA was told, from poor handling and poor filtration of components or the final blend. It also comes from small containers. It is in the form of dirt particles, slivers of metal, extruded seaming compound, soldering flux, fibers and lint, and incomplete solution of dye or other compounds.

Containers seem to be the worst offenders. Fabrication of a tin-plated can free of foreign contaminants is extremely difficult. Experiments are now being made with plastics, glass, and aluminum. A trial contract has been awarded for a drawn aluminum can.

PROCESSING BRIEFS . . .

Ethylene capacity of the Phillips Chemical Co. plant at Sweeney, Tex., will be raised 75,000,000 lb. to 255,000,000 lb. annually, when a new addition is completed this year. The ethylene produced at the Phillips Petroleum Co. subsidiary plant is shipped to Houston for use by polyethylene manufacturers.

Contract for construction of a new $3 million catalytic reforming unit at Continental Oil Co.'s 53,000-bbl. refinery at Lake Charles, La., has been let to Bechtel Corp. The 11,000-bbl. a day unit will be completed by the end of the year.

A $10-million polypropylene plant will be built at Neal W. Va., by Novamont Corp., subsidiary of Montecatini. The plant, with a capacity of ten million pounds annually of polypropylene and other polyolefins, is due for completion within 2 years.

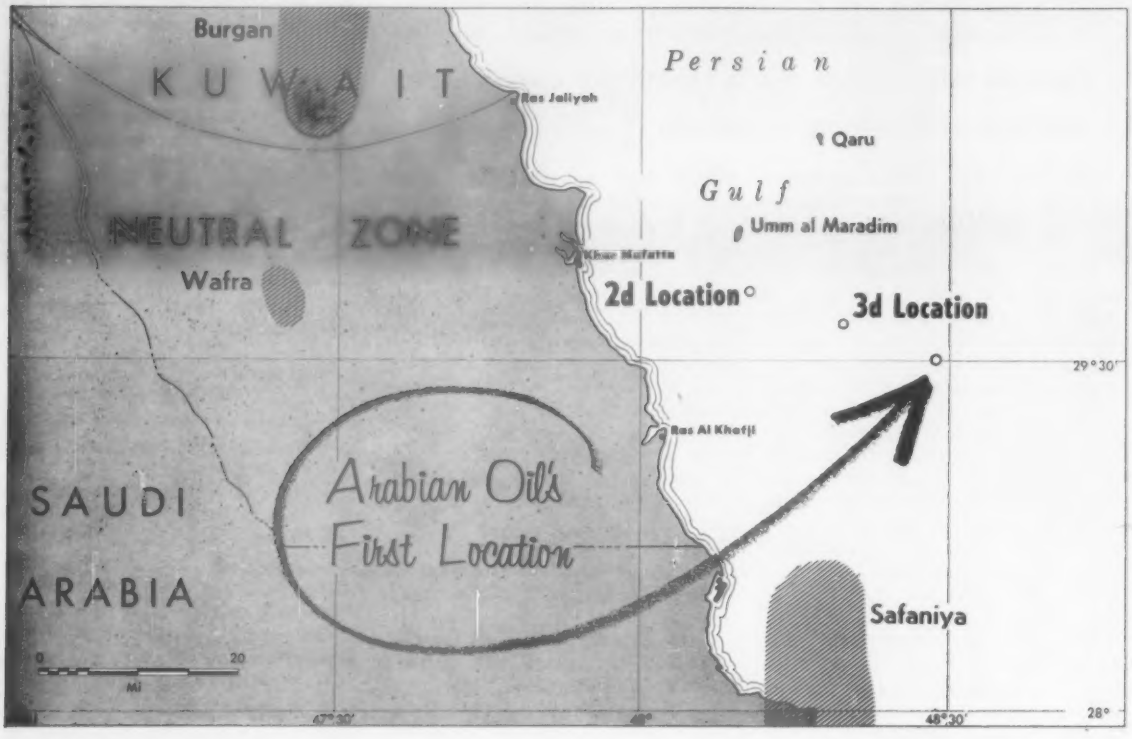
Completion is scheduled late this year of the $2-million expansion of Continental Carbon Co.'s carbon black plant at Lake Charles, La. The work is being done by Fish Engineering Co., Houston. It will increase the plant's annual capacity from 45 million to 70 million pounds of high abrasive carbon black.

A 22,000-bbl. Ultraformer at the Standard Oil Co. (Ind.) Whiting, Ind., refinery, damaged by an explosion and fire June 26-27, will be back in service in about 60 days. Damage in the 7-hour blaze was estimated at $100,000, mainly to the unit's furnaces. Four men suffered minor injuries.

Also for Refiners . . .

IN THE NEWS: American Oil refineries at Texas City and El Dorado closed by strikes (p. 69) . . . Military sees growing need for jet fuel through 1965 (p. 76) . . . Smogless car proposed by Union to reduce pollution problem (p. 85) . . . New planes require purer fuels and lubes, MPSA tells refiners' meeting (p. 87) . . . Petrochem industry in Western Europe to keep booming (p. 90) . . . Fluor Corp. and Utah Construction get contracts for Australian petrochem plant (p. 91).

PLUS THESE TECHNICAL FEATURES: Refinery cost indexes (p. 105) . . . Champlin's digital computer keeps an eye on how changes in operations affect costs, yields, and revenue (p. 110) . . . Electronic computer helps make complete balances over entire refinery (p. 117) . . . Quarterly Costimating report (p. 133).



Stage Set for Important Persian Gulf

• Japanese company is about to spud first well in its concession off the Neutral Zone. Company is optimistic—and already has staked locations for second and third wells.

Paul E. Swain
International Editor

THE JAPANESE won't just get their feet wet. They're plunging headfirst into deep Persian Gulf waters with the first test of their offshore Neutral Zone concession.

The Japanese broke the traditional 50-50 profit split to get the concession. Now they are throwing caution to the winds with the first hole they drill. It should spud within the next few days.

When the final papers were signed with both Saudi Arabia and Kuwait just a year ago, Middle East experts assumed the Japanese would move in just as closely to Arabian American Oil Co.'s big Safaniya field as undefined boundaries would permit. This hasn't proved to be the case.

The Japanese-organized Arabian Oil Co. will go for broke with an 8,000-ft. Arab zone test in 102 ft. of water 25 miles offshore. The new test will be 25 miles north-northeast of the closest Safaniya producer.

Pressed by troubles in Tokyo with financial backers who cooled off after the first flush of optimism, the newest Middle East oil company wants a big discovery quick. Seismic work done by the Japanese found a structure which they hope will put them in the oil business overnight.

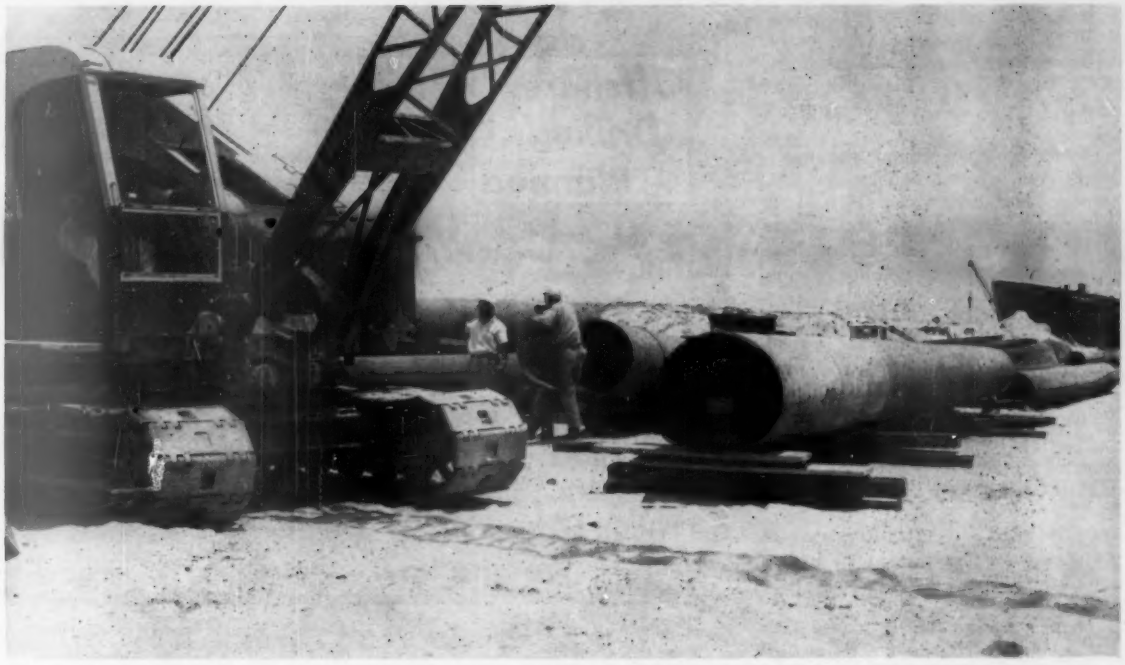
Japanese officials in the Neutral Zone are showing signs of confidence that would make a conservative western oil man cringe in horror. At the time they staked the first location, they spotted No. 2 and No. 3. The second test already staked is 20 miles west-northwest of the first. The third will be just halfway between the first two.

The first wildcat hasn't been named yet. The location was marked by a yellow buoy and when Japanese engineers talk about the well in English, it comes out "Yellow Boy."

Equipment . . . With admitted limited drilling experience and almost no offshore drilling know-how, the Japanese are making use of American equipment and U.S. and European brains.

Arabian Oil Co. has a 2-year drilling contract with International Drilling Co., active in the Middle East, and Reading & Bates Offshore Drilling Co., Tulsa. The drilling will be done from the "C. E. Thornton," a Le Tourneau three-legged platform owned by the Tulsa company, which also will supply the tender for the operation.

Revamping almost the entire electrical system of the platform has de-



ACTIVITY has picked up in the small village of Khor Mufatta on the coast of the Neutral Zone as the spudding date approaches for the first wildcat on an offshore concession held by Arabian Oil Co., Ltd., a Japanese firm. Among the supplies pouring into the camp is 30-in. conductor pipe for the well.

Wildcat

JAPANESE oil men directing the offshore test are, left to right, R. Funakoshi, managing director of Arabian Oil; H. Yamanouchi, chief geologist and manager of the Neutral Zone office; and T. O. Yoshizaki, drilling engineer.

layed spudding the well. The 3,000-ton mobile platform took a beating from the elements on the tow from the Gulf of Mexico to the Neutral Zone.

After the rewiring job was completed, the 140-ft. legs of the platform were extended with 30-ft. extensions to make certain drilling could be started with the platform floor at least 25 ft. above water level.

Casing program . . . The Japanese plan to set 100 ft. of 30-in. conductor pipe and then 600 to 1,000 ft. of 20-in. surface casing in a 26-in. hole before dropping to 13-in. casing.

They plan to land the 13-in. at 2,700 ft. and then carry the 9-in. to 6,600 ft. The last 1,400 ft. of hole will have 7-in. casing.

The new Japanese company has also borrowed talent from its own homeland. The drilling engineer for the operation is T. O. Yoshizaki, on loan from Japan Petroleum Exploration Co., the jointly owned government-private company which has done some offshore work off Japan's western coast.

After Yoshizaki spotted the first wildcat location for the Journal and a visiting American geologist, he almost exploded all the Japanese confidence with the $64 question.

He looked up quizically from the map and asked:

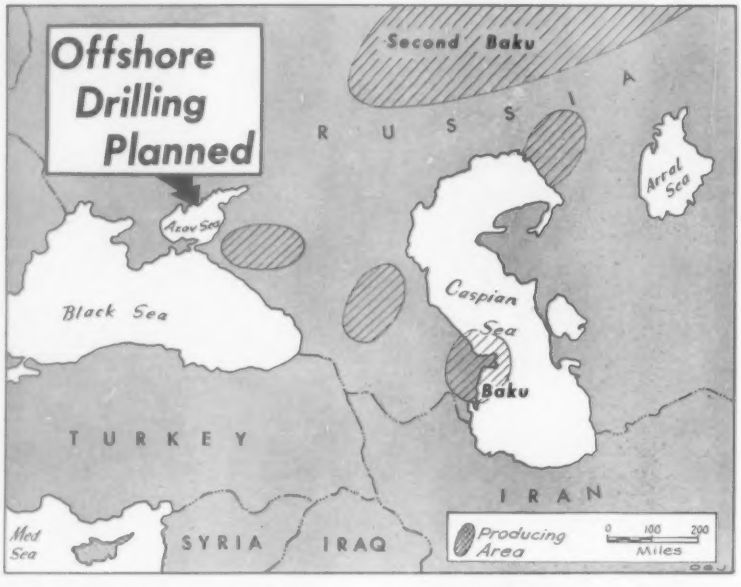
"Think we'll find oil out there?"

Russians Map Drilling Plans for Azov Sea

RUSSIA is planning an extensive offshore search for oil and gas in the Azov Sea, a shallow body of water east of Crimea and north of the Black Sea.

Soviet geologists believe the underwater area is a continuation of fields in the northern Caucasus and in Krasnodar District, on the eastern shore of Azov Sea. Results have been favorable in both gravity and seismic surveys of the area.

If production is found, the Russians plan to develop the fields using the same methods which have evolved with considerable success in offshore fields in the Caspian Sea off Baku. This would probably include networks of piers extending from shore to support surface equipment.



New bit used . . . The Russians are using a new bit called the "hydromonitor" bit in their Caspian Sea drilling program.

Details of how the bit works have not been released, but the bit is supposed to give added cutting action that steps up drilling 30 to 35%. The Russians are using the bit with turbodrills in the Caspian.

In the Karadag field near Baku, the Reds claim they have established a new drilling record for the country by making 3,717 ft. of hole in 97 hours. They used an electric rig in the Karadag well.

Petrochem Industry Booming

. . . in Western Europe with 118% expansion forecast over 3-year period. Total investment will hit $1.2 billion.

WESTERN Europe's thriving petrochemical industry is going to keep right on growing.

Output of petrochemicals rose 30% in 1958 to 830,000 tons. This year, production will reach 2 million tons, enough to take care of most domestic markets.

To meet this growth, new plants will be added at a fast clip, pushing total investment in the industry by the end of 1960 to $1.2 billion. These conclusions have been drawn by the Organization for European Economic Cooperation (OEEC).

The OEEC study covers the United Kingdom, France, Germany, Italy, the Netherlands, and Belgium, member countries where the industry exists. Its comparisons are based on actual investments at the end of 1957 and projected investments by the end of 1960.

Europe's petrochemical industry will still be small in comparison with the U.S. But its growth will be faster. The booming U.S. industry is expected to expand 78% between late 1957 and the end of 1960. Europe, in the same period, will be expanding 118%.

Britain tops . . . Figures supplied by a Shell group company show that last year the leading producer was Britain, with 327,000 tons.

Next were Germany, with 187,000 tons; France, 142,000 tons; Italy, 130,000 tons; and Netherlands, 45,000 tons.

During the 1957-1960 period, OEEC predicts:

. . . United Kingdom investments will add up to $181 million for plants that will take feed from oil, a small amount of slackwax, and some refinery gas.

Among the products of new plants will be styrene-butadiene rubber, ethylene oxide and derivatives, polyolefins, and raw materials for plasticisers, synthetic fibers, and synthetic detergents.

. . . Western Germany will probably see another $120 million invested.

Requirements for petroleum feedstocks will more than treble. There also will be a "spectacular" rise in consumption of oil fractions. A smaller increase is expected in the use of refinery and natural gas.

Plants included in expansion plans will make styrene-butadiene rubber, polyethylene, ethyl alcohol, ethylene glycol, propylene, detergents, and solvents.

. . . France may see a greater growth than any other country in Europe. The size of the industry is being quadrupled with an anticipated new investment of $211 million.

Products from new plants will include styrene/butadiene type, butyl, and nitrile rubbers, ethylene oxide and acetylene and derivatives, dodecylbenzene, and propylene and derivatives.

. . . Italy will have a new investment of $110 million.

Chemicals will include polyethylene, ethylene oxide derivatives, styrene, isopropyl alcohol, polypropylene, propylene tetramer, alcohols, butadiene, and polybutylene.

. . . Netherlands production next year will more than double last year's 45,000 tons. Expansion programs will mainly increase facilities for making synthetic detergents and plasticisers and intermediates for synthetic rubber.

. . . Belgium's lone petrochemical project is designed to produce ethylene oxide and derivatives, acetone, phenol, and raw materials for detergents.

Poles May Buy Oil

. . . from Iraqi Government. Or swap for tankers may be in the making.

THE IRAQ Government may become the first in the Middle East to sell royalty crude to a Communist buyer.

Poland has offered to take part of the 12½% share of local production, which the government is entitled to sell under the terms of the concession agreement with the Iraq Petroleum Co. group. Reports from Baghdad are that a delegation of Poles will arrive soon to close the purchase. Poland has offered to sell tankers to Iraq, meaning a swap of ships for oil may be in the making.

Iraq has a royalty of 12½% of IPC production. It can either sell the oil on its own in world markets, or it can sell it back to IPC at seaboard posted prices.

Similar royalty arrangements are part of the other 50-50 profit-sharing agreements in effect in the Middle East.

The proposed crude deal is only one of several points which the 1-year-old Iraq Government is stressing in an effort to take a more active role in the domestic oil industry. The government has asked for representation on the IPC board, and the question is now under discussion in London. IPC also is being pressed to increase crude production and to relinquish some of its acreage to make room for more companies.

Atlantic's Profits Increased

ATLANTIC REFINING has closed the ledger on the 1954 sale of its Eastern Hemisphere properties with a net profit that has added up to $40,600,000.

The company sold its marketing properties in south, west, and north Africa, Portugal, Belgium, and several other European countries to British Petroleum. BP made an initial payment in cash, with the balance made up of deliveries of Middle East crude to Atlantic in the U. S.

The actual sale price has never been revealed. But Atlantic at the time of the sale anticipated a net profit of about $29,800,000.

BP wound up its obligations to Atlantic with crude shipments this year valued at $700,000.

Australian Plant Slated

STANDARD-VACUUM Oil Co.'s $28-million petrochemical plant at Altona near Melbourne, Australia, will be built by two U. S. companies —Fluor Corp., Ltd., as prime contractor in association with Utah Construction Co. of Salt Lake City.

The actual work will be conducted by subsidiaries of each—Fluor International S.A., and Utah Australia, Ltd.

The Standard-Vacuum plant is part of a four-unit petrochemical complex. It will supply the raw materials to be used in the manufacture of polyethylene, styrene, and GR-S rubber by the three other companies in the complex. The others involved are Union Carbide, CSRC-Dow interests, and Australian Synthetic Rubber Co., Ltd., a subsidiary of Vacuum Oil Co., Pty., Ltd. Vacuum in turn is a subsidiary of Standard-Vacuum.

The Standard-Vacuum plant's output will include about 20,000 tons of ethylene annually and the butadiene required for 30,000 tons of synthetic rubber annually. Construction will probably start in the final quarter of this year with completion scheduled for mid-1961.

Production Slated

. . . for methane trapped in Belgian Congo's Lake Kivu.

PLANS are being made for commercial development of a weird gas field trapped in the waters of a Belgian Congo lake.

The Congo Water Authority has announced a program for producing 97 to 145 million cubic feet of methane daily from Lake Kivu. The gas will be used largely as fuel and to manufacture fertilizer.

Lake Kivu, lying in the mountains of eastern Belgian Congo, has a 600-ft. methane-saturated zone covering 586 sq. miles of lake bottom. The gas is locked in the waters of the lake itself. Reserves are estimated at more than 2 trillion cubic feet, out of 8 trillion cubic feet of gas in the zone.

One of the biggest problems is expected to be utilization of the carbon dioxide, which amounts to about 80% of the gas produced by volume. One possibility would be the construction of refrigeration plants at the site.

Phillips Expands in Algeria

PHILLIPS Petroleum Co. and two French partners have acquired another exploration permit in the French Sahara.

The new Hassi Chaambi concession is 390 miles south of Algiers and about 60 miles southeast of Hassi Messaoud field. It covers a 148,262 acre area which adjoins the southern boundary of the El Morr permit obtained earlier. The total area of the enlarged block is 469,492 acres.

Phillips has a 25% interest in the new permit. Its French partners are COPEFA and Ominirex. COPEFA will be the operator.

FOREIGN BRIEFS . . .

A 2.125% override on Libyan concessions covering 22 million acres has been acquired by Christian Oil Corp. The royalty covers concessions 74, 75, and 76, held by Pan American Libya Oil Co.

British Petroleum has changed the name of its purchasing subsidiary in the U. S. to BP (North America), Ltd. Former title was BP Trading, Ltd.

An expansion at Petrobras' Mataripe refinery is ahead of schedule, and the Brazilian plant is expected to go on stream in August. A 42,000-bbl. crude unit will replace an existing 10,000-bbl. unit. Other additions include an 18,500-bbl. vacuum unit, a 12,000-bbl. fluid cat cracker, a 2,800-bbl. lube-oil plant, and paraffin facilities.

Swiss bankers and industrialists have formed a new oil financing company, Swiss Petrol Holding. Purpose of the firm is to give local interests a share in any exploration ventures in Switzerland.

Exports of Soviet bloc oil are on the rise. Cargoes out of the Black Sea were booked at the rate of slightly more than one per day in June. They were mostly dirty cargoes destined for continental ports though some went to South America.

A 20,000-bbl. refinery planned for Hungary will be linked to the Russia-Eastern Europe pipeline system. The plant will be located at Szazhalombatta, 17 miles south of Budapest. This is one of the terminals of a proposed pipeline to carry crude from field east of the Volga river to Hungary, Poland, Czechoslovakia, and East Germany (OGJ, June 8, p. 130).

World Output Drops After Big Gains

- Middle East production hits another peak, but world-wide total declines 220,000 bbl. daily.

FREE-WORLD crude production tumbled 220,000 bbl. daily in April as a winter-long gain ended with the coming of spring.

United States operators increased output 68,000 bbl. daily, but other Western Hemisphere production slipped sharply. Venezuela was off 268,700 bbl. daily, and Canada about 55,800 bbl. daily.

The Middle East reached another all-time record, but the latest gain was relatively small. A new record was set by Kuwait wells, which yielded 1,587,600 bbl. daily. The gain, however, was offset for the most part by declines in Saudi Arabia and Iran.

Colombia operators produced a record 146,700 bbl. daily, largely the result of 18,700 bbl. daily from 15 wells in Cicuco field. Texas Petroleum Co. and Mobil Oil brought in the find 3 years ago in Lower Magdalena River Valley.

TREND OVER THE LAST YEAR

	Western Hemisphere, less U.S.	Middle East	Total Free World outside U.S.
1958			
April	3,608.4	4,123.0	8,532.0
May	3,582.9	4,087.8	8,468.2
June	3,678.0	4,156.8	8,654.2
July	3,777.0	4,237.2	8,832.6
August	3,828.4	4,334.0	8,971.5
September	3,769.8	4,535.2	9,120.8
October	3,891.3	4,482.3	9,177.5
November	4,037.8	4,472.1	9,309.5
December	4,119.9	4,446.2	9,371.4
1959			
January	4,311.6	4,369.3	9,449.5
February	4,453.9	4,426.1	9,649.7
March	4,220.6	4,634.2	9,680.7
April	3,904.7	4,646.4	9,392.0

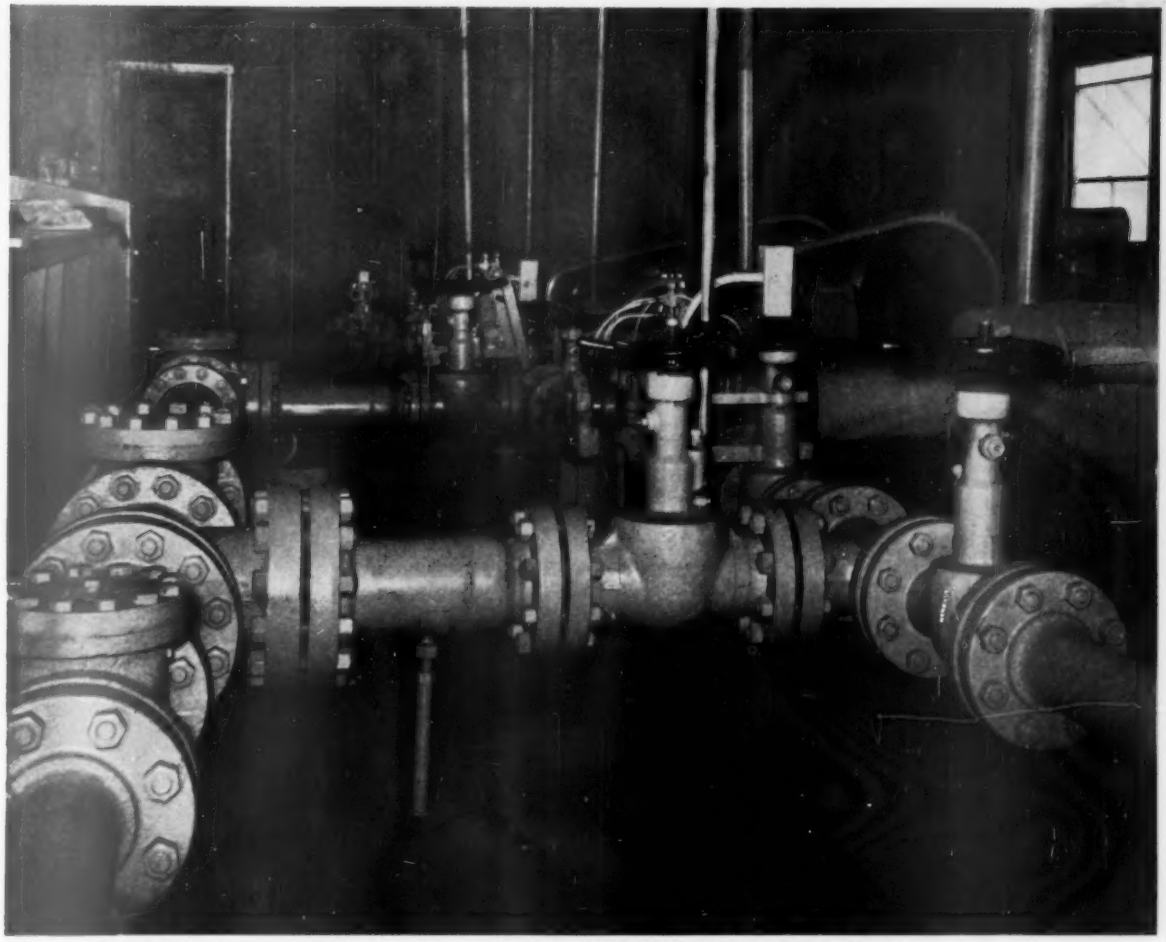
World-Wide Crude Production: Daily Average in Thousands of Barrels

Country—	Apr. 1959	Mar. 1959	Apr. 1958
Western Hemisphere			
Argentina	121.0	121.0	94.3
Bolivia	8.6	8.3	9.5
Brazil	53.1	53.1	45.4
Canada	431.8	487.6	401.3
Chile	15.7	15.7	14.9
Colombia	146.7	138.1	122.6
Cuba	0.6	0.6	1.0
Ecuador	8.1	8.1	8.6
Mexico	269.9	269.9	256.7
Peru	49.3	49.3	47.2
Trinidad	109.1	109.4	99.2
Venezuela	2,690.8	2,959.5	2,507.7
Total	3,904.7	4,220.6	3,608.4
Europe			
Austria	45.6	45.4	54.1
France	29.8	28.7	27.3
West Germany	98.5	94.6	82.8
Italy	31.0	32.9	34.6
Netherlands	33.4	33.4	28.6
United Kingdom	1.7	1.7	1.7
Yugoslavia	11.8	10.7	8.7
Total	251.8	247.4	237.8
Middle East			
Bahrain	45.1	45.1	40.1
Iran*	871.0	977.0	848.0
Iraq†	811.1	792.3	636.4
Israel	2.0	2.0	1.2
Kuwait	1,587.6	1,363.6	1,397.9
Neutral Zone	110.5	110.5	77.4
Qatar	169.5	177.7	187.0
Saudi Arabia	1,043.1	1,159.5	928.3
Turkey	6.5	6.5	6.7
Total	4,646.4	4,634.2	4,123.0

Country—	Apr. 1959	Mar. 1959	Apr. 1958
Other Asia			
British Borneo	107.0	107.0	104.2
Burma	10.5	10.5	8.3
India	8.5	8.5	8.5
Indonesia	350.0	340.0	341.7
Japan	6.7	7.3	7.0
New Guinea	5.0	5.1	5.4
Pakistan	5.9	5.9	5.9
Total	493.6	484.3	481.0
Africa			
Algeria	13.6	11.7	8.4
Angola	0.8	0.8	0.8
Egypt	58.9	60.0	56.2
Gabon	13.8	13.3	8.3
Morocco	1.8	1.8	1.5
Nigeria	6.6	6.6	6.6
Total	95.5	94.2	81.8
Free World			
Foreign	9,392.0	9,680.7	8,532.0
United States	7,256.0	7,188.0	6,287.0
Total	16,648.0	16,868.7	14,819.0
Communist Countries in Soviet Orbit			
Romania	235.0	235.0	229.0
Russia	2,420.0	2,420.0	2,260.0
Others	60.0	60.0	60.0
Total	2,715.0	2,715.0	2,549.0
WORLD TOTAL	19,363.0	19,583.7	17,368.0

*Includes estimated 5,000 bbl. daily from Naft-i-Shah field not operated by consortium companies. †Includes estimated 3,300 bbl. daily from Naft Khaneh field, operated by Iraq government.

Figures are from reliable industry reports or government sources. Estimates are made where complete reports are lacking



Orbit Valves installed on discharge pumps, water flood project, Ward County, Texas.

ORBIT VALVES *are widely used in water flooding systems — for services such as:*

INJECTION WELLS
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ETHYL ADDITIVE RESEARCH ...The final answer is on the road

In 1958, Ethyl's test cars and cooperating car and truck fleets logged over eight million miles on the road in evaluating fuel and lubricant additives.

Here Ethyl technicians control gasoline blending with laboratory accuracy, in quantities up to 10,000 gallons.

Why Fleet Evaluation

Prospective additives for fuels and lubricating oils require extensive testing and evaluation before being made available commercially.

In addition to evaluating their effectiveness on their prescribed job, additives are checked for possible detrimental effects such as reduced valve and spark plug life, engine wear and increased combustion deposits.

Initial screening is performed in the laboratory through chemical and engine tests. But the final answer comes from broad-scale investigation under actual use conditions.

The development of a successful additive requires careful study before it can be marketed with the assurance that overall behavior is beneficial. Durability aspects are perhaps most important since very small concentrations of certain chemicals may either greatly improve or reduce engine life.

As an example, the figure shows data from passenger car fleet work on seven different experimental fuel additives. In this study, exhaust valve life was evaluated under heavy duty road operating conditions.

Blending for Fleet Tests

Fleet work requires large quantities of test fuel that must be blended with laboratory precision to eliminate variations in additive concentrations.

To provide accurate test fuel blends for passenger car and truck fleets, Ethyl maintains blending plants at Detroit, San Bernardino and San Antonio.

At these plants, experimental fuels are put together in batches ranging up to 10,000 gallons. Each blend must be prepared with the care and accuracy that is usually required only for laboratory work.

At Ethyl's Detroit laboratory, precision fuel blending equipment includes two positive displacement pumps, each capable of handling 230 gallons per minute; seven 10,000-gallon storage tanks which are interconnected to fa-

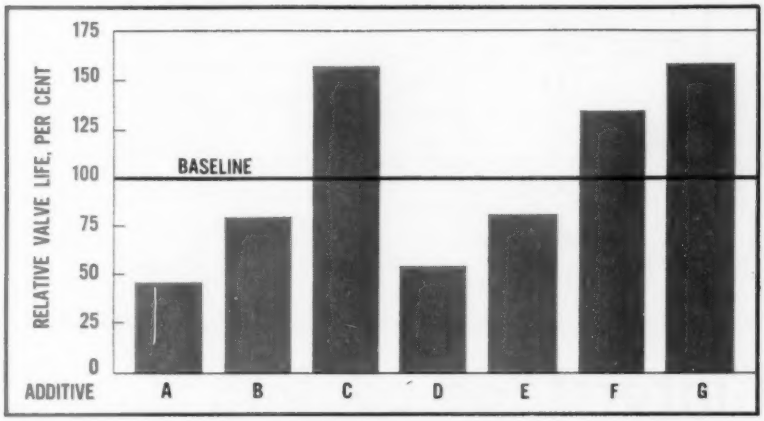
cilitate blending flexibility; and an accurate eductor and weigh-scale system for precise measurement of additives to be used in experimental fuel.

Fleet Tests for New Antiknocks

This equipment permits precise blending of Ethyl's experimental antiknocks for fleet study. The following engine aspects are evaluated on the road:

Inductibility
Engine wear
Oil oxidation
Octane requirement increase
Valve durability
Spark plug life
Surface ignition

Because of Ethyl's fleet work with the new manganese additive (AK-33X), a new antiknock is now on the commercial horizon. In many cases this new product will afford the refiner more economical octane numbers; in all cases it will give the refiner additional chemical octane flexibility for planning future gasolines.



Experimental fuel is transferred to a gasoline tanker.

How Ethyl Research can help you

Painstaking evaluation of every development step from the test tube to the cars on the road assures refiners that all new Ethyl products meet the criteria of commercial acceptability.

Ethyl Research Representatives are in direct contact with such research programs. As a result, they are able to maintain a continuous flow of up-to-date information to customer research people.

If you would like more information about the program that was used to evaluate the new manganese antiknock, contact your Ethyl Representative.

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ANTIKNOCK COMPOUND
ETHYL CORPORATION

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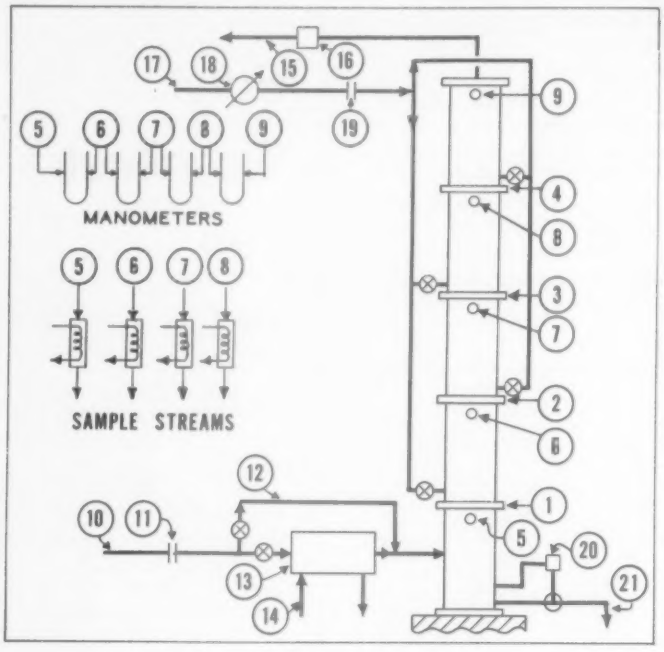
Ethyl Corporation of Canada Limited, Toronto
Ethyl USA (Export) New York 17, N. Y.

RESEARCH LABORATORIES
Ferndale 20, Detroit, Michigan
San Bernardino, California



FRACTIONATING COLUMN consisted of five 2-ft. flanged sections of 6-in. Sch. 40 pipe. Plates were of perforated type and made of 20-gage aluminum. Fig. 1.

LEGEND

1-4	Plates 1 through 4
5-9	Pressure and sample taps
10	Inlet-air stream
11	Orifice
12	Bypass
13	Preheater
14	Steam line
15	Exit-air stream
16	Pressure regulator
17	Water-inlet stream
18	Pump
19	Orifice
20	Liquid-level controller
21	Exit-water stream

Direct-contact interstage cooling

. . . *What are its possibilities?*

Here are heat and mass-transfer coefficients for the air-water system. Direct cooling would save $24,000 per million standard cubic feet per hour for compressor investment alone figured at $300 per horsepower.

BY WILLIAM S. STEWART
AND R. L. HUNTINGTON
University of Oklahoma, Norman

COOLING OF GASES by direct contact with liquids has large-scale industrial applications, most of which are wetted-wall, packed, and spray towers. From the results of a recent experimental study at University of Oklahoma, large savings appear possible both in power and heat-exchange cost by cooling natural gas between compressor stages through direct contact with water as compared to piping gas to and from somewhat remote cooling towers.

This work was undertaken to obtain values for heat and mass-transfer coefficients for a 6-in. by 10-ft. perforated-plate column when operated as a direct-contact cooler and to determine the effect of the four variables—liquid-flow rate, gas-flow rate, gas temperature (140° to 240° F. inlet), and column pressure (1 to 5 atm.)—on the heat and mass-transfer coefficients.

Values for the over-all heat-transfer coefficient, gas-film heat-transfer coefficient, liquid-film heat-transfer coefficient, and over-all or gas-film mass-transfer coefficient have been calculated from the experimental data.

This paper is abstracted from a thesis which was presented as partial fulfillment of a master's degree in chemical engineering in 1958. Presented before Heat Transfer Symposium, sponsored by ASME and AIchE, Chicago.

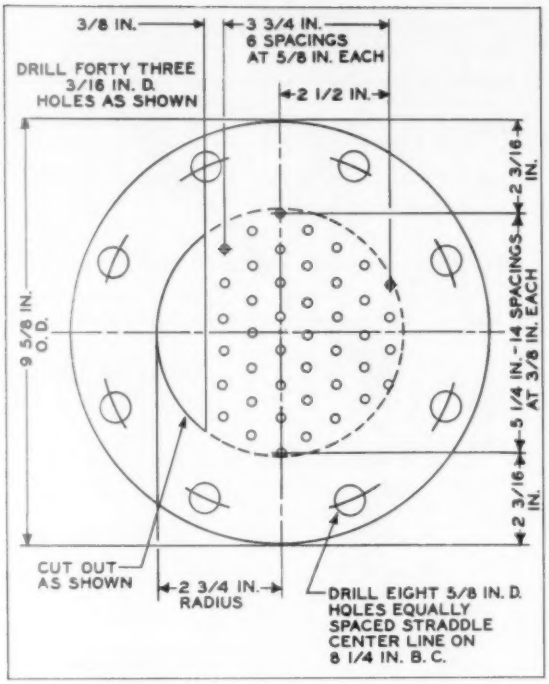
Interstage Cooling

In view of the billions of cubic feet of gas cooled daily in compressor stations throughout the petroleum industry, it is well to consider any new method which might effect savings in horsepower and heat-exchanger costs.

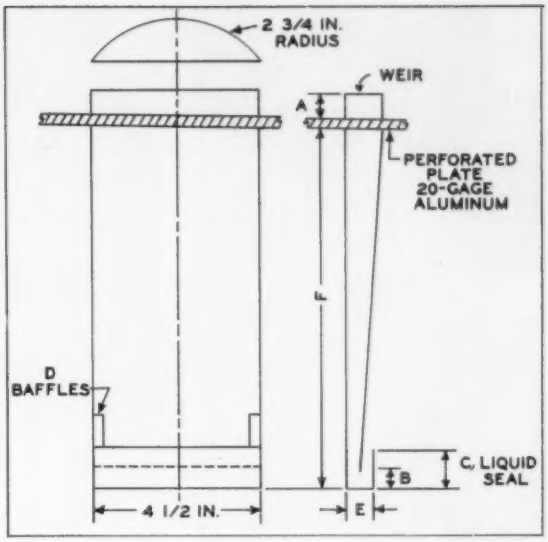
Conventional method is to pipe the hot gas from the compressor room to the water-cooling tower and back to the suction of the next compressor stage.

The total pressure drop for this cooling step usually requires a frictional loss of about 10 psi. At a discharge pressure of 100 psig. this pressure drop will cause a loss of 107 hp. per M.M.s.c.f. of gas processed per hour.

Direct cooling . . . Let us consider the cooling of this same gas stream by direct contact with water in a short cylindrical tower or preferably a sphere containing two perforated


3/8 IN.
3 3/4 IN.
6 SPACINGS AT 5/8 IN. EACH
DRILL FORTY THREE 3/16 IN. D. HOLES AS SHOWN
2 1/2 IN.
2 3/16 IN.
9 5/8 IN. O.D.
14 SPACINGS AT 3/8 IN. EACH
5 1/4 IN.
2 3/16 IN.
CUT OUT AS SHOWN
2 3/4 IN. RADIUS
DRILL EIGHT 5/8 IN. D. HOLES EQUALLY SPACED STRADDLE CENTER LINE ON 8 1/4 IN. B. C.

DRAWING of a perforated plate. Fig. 2.



Downspout to plate No.	A (in.)	B (in.)	C (in.)	D (in.)	E (in.)	F (in.)
1	1	½	1	2	½	15⅛
2	1	½	1	2	⅞	22⅛
3	1	⅞	1	2	5/8	22⅛
4	1	⅜	1	2	⅞	22⅛

DRAWING of a downspout and its dimensions. Fig. 3.

plates and downspouts. The horsepower requirement would be reduced to one-fourth of the conventional method described above. This saving alone would be $24,000 per M.M.s.c.f. per hour for compressor investment alone at $300 per horsepower.

The second saving would be the difference between the high cost of piping gas to and from the cooling tower and the much smaller cost of transferring the same heat release direct to water through a closed soft-water system. The third saving would be the investment in gas-cooling coils less the cost of installing two trays in the interstage scrubber (a necessary vessel in either case) less the cost of the water-cooling coils.

These water-cooling coils would entail a much smaller investment than that of the gas coils. The only other cost item would be the small expense of pumping the cooling water through the enclosed water system.

Experimental . . . Studies of the direct-contact method have been made in the chemical-engineering laboratories at University of Oklahoma. In the first phase of this program it was considered advisable to reduce the number of variables by selecting a conventional perforated-plate design and varying inlet-air input rate and temperature, water rate, and tower pressure.

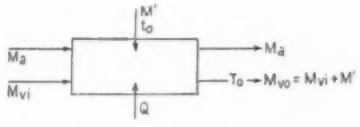
From the studies it appears that this method of direct heat transfer to water has distinct economic advantages over the conventional process of transferring heat through gas coils in a somewhat remote cooling tower.

Heat and mass-transfer data for various tower packings and for spray towers are reviewed by Perry[5] and Sherwood and Pigford.[6] West and others[7] have calculated mass-transfer coefficients for the absorption of CO_2 by water on a bubble plate.

The System

A general discussion on the mechanism of direct contact, countercurrent cooling and the development of equations can be found in Brown,[3] McAdams,[4] Perry,[5] and various other texts on the subject.

Consider the situation in which water is flowing countercurrent to and in direct contact with air and take only the gas stream as the system:



Where:

M_a = mass dry air entering, lb./hr.
M' = mass water vaporized, lb./hr.
M_{vi} = mass water vapor entering with air, lb./hr.
M_{vo} = mass water vapor leaving with air, lb./hr.
T_i = temperature of inlet air, °F.
T_o = temperature of exit air, °F.
t_o = temperature of exit water, °F.
Q = total heat transferred to the air stream, B.t.u./hr.
H = enthalpy.

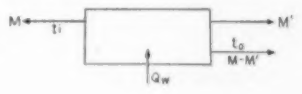
Then from the first law of thermodynamics, assuming steady-state conditions:

$$(H_{M_a, T_i} + H_{M_{vi}, T_i} + H_{M', T_o}) - (H_{M_a, T_o} + H_{M', T_o} + H_{M_{vi}, T_o}) + Q = 0 \qquad (1)$$

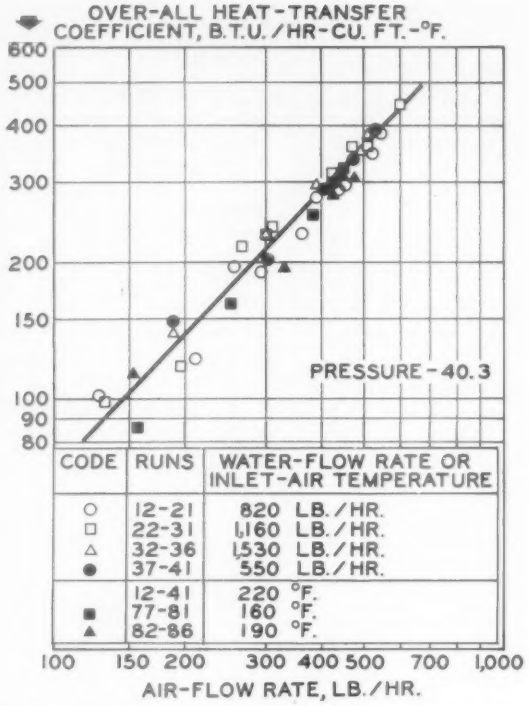
Assuming that the liquid (M') vaporizes at the exit-liquid temperature and enters the system as a vapor, and that the mass of dry air remains constant, then from Equation 1 by collecting terms:

$$M_a C_{pa} (T_i - T_o) + M_{vi} C_{pv} (T_i - T_o) + M' C_{pv} (T_o - t_o) = -Q \qquad (2)$$

Considering only the liquid stream as the system:



PHOTOGRAPH of the equipment. Fig. 4.



EFFECT of water-flow rate and inlet-air temperature on the over-all heat-transfer coefficient. Fig. 6.

where:

M_a = mass of water entering, lb./hr.
M' = mass of water vaporized, lb./hr.
Q_w = total heat transferred to water stream, B.t.u./hr.
t_i = inlet-water temperature, °F.
t_o = exit-water temperature, °F.

From the first law of thermodynamics:

$$MC_{pw}(t_i - t_o) + M'\lambda t_o = -Q_w \quad (3)$$

$$-Q_w = Q = q_s + M'\lambda \quad (4)$$

where λ = latent heat of vaporization B.t.u./lb.

Assuming a two-film model for heat transfer, then the gas-film heat-transfer coefficient, the liquid-film heat-transfer coefficient, and the over-all heat-transfer coefficient are defined by Equations 5, 6, and 7, respectively.

$$Q = h_g a\, V (T_{avg} - T^*) \quad (5)$$

$$q_s = h_l a\, V (T^* - t_{avg}) \quad (6)$$

$$Q = UV (T_{avg} - t_{avg}) \quad (7)$$

where:

T_{avg} = bulk temperature of gas, °F.
t_{avg} = bulk temperature of liquid, °F.
T^* = interface temperature, °F.
V = tower volume between plates, ft.³
$h_g a$ = gas-film heat-transfer coefficient, B.t.u./hr.-ft.³-°F.
$h_l a$ = liquid-film heat-transfer coefficient, B.t.u./hr.-ft.³-°F.
U = Over-all heat-transfer coefficient, B.t.u./hr.-ft.³-°F.

The relationship between the coefficients is:

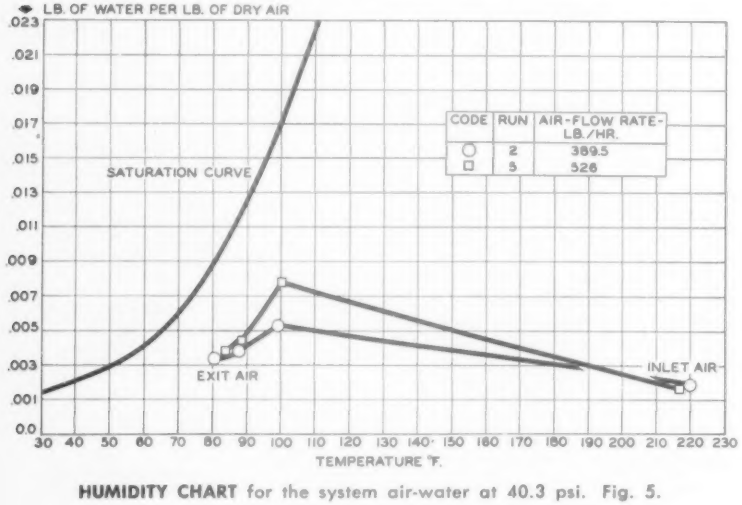
$$\frac{1}{U} = \frac{1}{h_g a} + \frac{1}{h_l a} - \frac{M'\lambda_{t_o}}{h_l a\,(Q)} \quad (8)$$

For mass transfer, the over-all coefficient, which in this case is substantially equal to the gas-film mass-transfer coefficient, is:

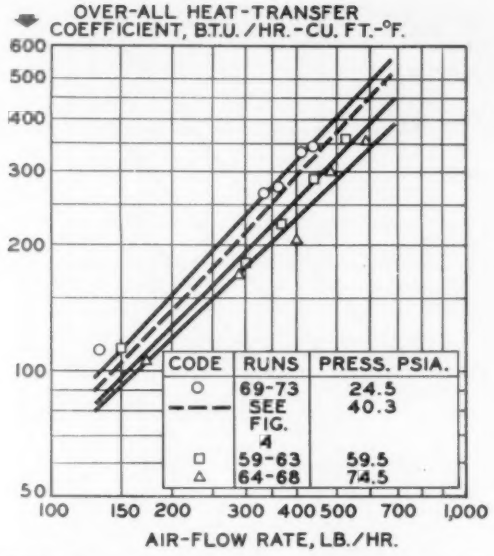
$$M' = KV (v.p.^* - V.p._{avg}) = k_g a\, V (v.p.^* - v.p._{avg}) \quad (9)$$

where:

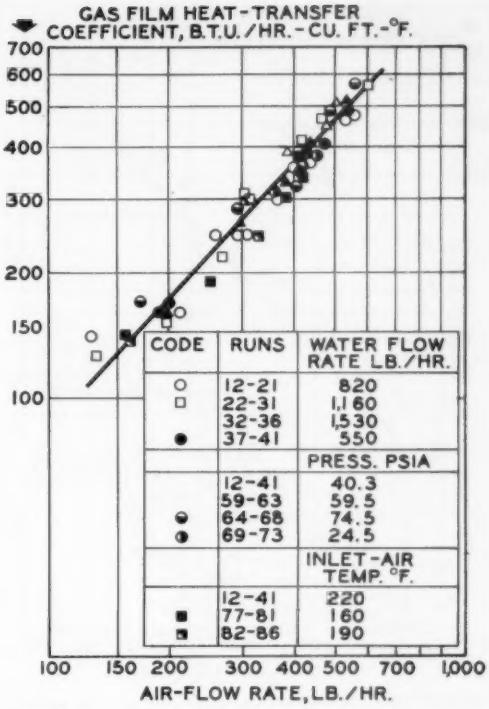
K = over-all mass-transfer coefficient, lb./hr.-ft.³-atm.
$k_g a$ = gas-film mass-transfer coefficient, lb./hr.-ft.³-atm.
$v.p.^*$ = vapor pressure at interface, atm.
$v.p._{avg}$ = average vapor pressure, atm.



HUMIDITY CHART for the system air-water at 40.3 psi. Fig. 5.



EFFECT of pressure on the over-all heat-transfer coefficient. Fig. 7.



EFFECT of water-flow rate, inlet-air temperature, and pressure on the gas-film heat-transfer coefficient. Fig. 8.

Some authors, like Bras,[1,2] take the interface temperature, T*, as equal to the bulk liquid temperature, thus eliminating the liquid-film resistance. This assumption is usually valid as the liquid-film resistance in most cases is not the controlling resistance. However, in this work the interface temperature will be taken as the adiabatic saturation temperature of the gas at its bulk temperature, as saturation at the interface will be assumed.

The Equipment

The fractionating column (Fig. 1) consisted of five 2-ft. flanged sections of 6-in. Sch. 40 pipe. The plates were of the perforated type and made of 20-gage aluminum. Each plate contained 43 drilled sharp-edged holes, ⅜-in. in diameter, on triangular pitch with the outer perimeter of the perforated area having a radius of 2½ in.

The downcomer was designed to spill the liquid on the back side of the downcomer as some of the plate holes were located directly beneath the downcomer. A weir height of 1 in. was used on all tests. The top section of the column contained a 3-in. section of wire mesh which served as a mist extractor. The column was insulated with Air-Cell insulation.

Drawings of the plates and downspouts are given in Figs. 2 and 3, respectively.

The air flow was measured by a water manometer in combination with a pressure gage. The air was preheated in a single-pass heat exchanger by use of 80-psig. steam. Maximum preheat temperatures were from 240° to 280° F. depending on outside temperature conditions. The source of air was 120-psig. compressor air supplied by the physical plant of the university. The air was introduced into the tower at a point 9 in. below the bottom plate.

Liquid flow . . . This was measured with an orifice-manometer combination in which carbon tetrachloride was used as the liquid. The water came from the university mains. A pump was placed in the water line in case higher water pressures were needed up to 95 psig. The water could be introduced on any plate in the column. The liquid level and seal in the bottom of the column was maintained by a liquid-level controller.

The column pressure was controlled by a pressure regulator. Water manometers were used for measuring the pressure drop across each plate and across the wire mesh.

The air temperature was measured as follows: inlet-air temperature by a thermometer in a well in the inlet-air line; at 9 in. below the bottom plate by a thermometer placed through the wall of the tower; at 12 in. above each plate by thermometers placed through the walls of the tower. The exit-air temperature was measured by a thermocouple (copper-constantan) placed in the exit-air stream. The thermometers were held in the column by standard copper fittings (⅛-in. copper tubing to ¼-in. iron pipe) using tapered Teflon sleeves as gaskets.

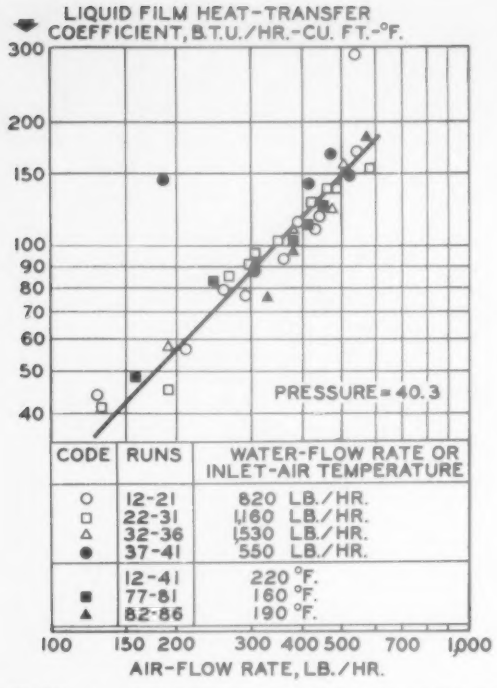
The inlet-water temperature was measured by a thermometer in a well, placed in the inlet-water line. The temperature of the water leaving each plate was measured by a thermocouple (copper-constantan) placed in the well of the downspout of each plate. The exit-water temperature was measured by a thermocouple placed in the exit-water line.

Air-sampling taps were provided approximately 2 in. below each plate by ⅛-in. copper tubes connected to ¼-in. needle valves to regulate the purges. The air samples were passed through glass water condensers and into glass condensate separators. The purge streams were measured by a wet test meter. The dew point was determined by an Electrodryer dew-point indicator, using ice water as a coolant.

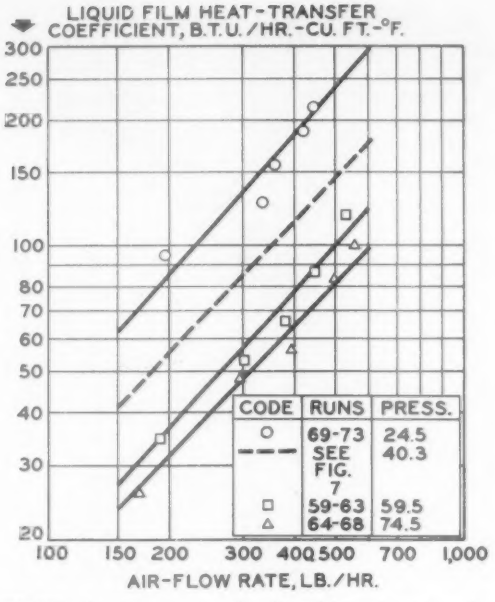
Fig. 4 is a photograph of the equipment.

Results

As there was only about 20° F. or less temperature differential between the gas leaving the first plate and the temperature of the water on that plate, little could be gained by



EFFECT of water-flow rate and inlet-air temperature on the liquid-film heat-transfer coefficient. Fig. 9.



EFFECT of pressure on the liquid-film heat-transfer coefficient. Fig. 10.

operating more than one plate insofar as heat transfer was concerned. However, a few three-plate runs were made to see if the second and third stages of contacting would serve as a dehumidifier.

The data for the three plate runs show that the second and third stages of contacting served as a dehumidifier. Although the gas leaving the first plate was not saturated, dehumidification occurred on the second and third plates because the partial pressure of the water vapor in the air was greater than the vapor pressure at the interface which is necessary for dehumidification to occur.

This dehumidification effect is shown in Fig. 5, which is a plot of the data for Runs 2 and 5.

Variables . . . Runs were made to determine the effect of air-flow rate, water-flow rate, pressure, and temperature on the over-all heat-transfer coefficient, and the mass-transfer coefficient. Runs 12 through 21, 22 through 31, 32 through 36, and 37 through 41 were made at constant pressure and constant inlet air temperature with varying air flow rate as the main variable and varying water-flow rate as the parameter, and Runs 77 through 86 were made to determine the effect of temperature.

The data do not show any noticeable effect of temperature or water-flow rate on the over-all heat-transfer coefficient. The data, however, do show an effect of pressure on the over-all heat-transfer coefficient. Fig. 6 is a plot of data taken to determine the effect of temperature and water-flow rate on the over-all heat-transfer coefficient. Fig. 7 shows an inverse effect of pressure on the over-all heat-transfer coefficient.

No attempt was made to correlate the data for the over-all heat-transfer coefficient because if correlations can be obtained for the other coefficients, a correlation for the over-all heat-transfer coefficient can be obtained through Equation 9.

Gas film controlling . . . In all cases the gas film was found to be the larger resistance and the major mode of heat transfer was by convection. No noticeable effect of pressure, temperature, or water-flow rate was observed on the gas-film heat-transfer coefficient. The gas-film heat-transfer coefficient was found to be a function only of the air-flow rate. Fig. 8 shows the effect of the air-flow rate on the gas-film heat-transfer coefficient. The data can be correlated by the equation

$$h_g a = 0.221G \qquad (10)$$

No noticeable effect of the liquid-flow rate or air temperature was observed on the liquid-film heat-transfer coefficient. Fig. 9 is a plot of the liquid-film transfer coefficient calculated from data taken to determine the effect of the liquid-flow rate and air temperature. The liquid-film coefficient was found to be a function of the air-flow rate and the pressure.

Fig. 10 shows a marked inverse effect of pressure on the liquid-film heat-transfer coefficient. The liquid film is a sizable resistance at the higher pressures amounting to approximately one-third of the total resistance at 75-psia. pressure. The liquid-film heat-transfer coefficient can be correlated by the equation

$$h_l a = 0.845\,(G)^{1.138}\,(P)^{-1.038} \qquad (11)$$

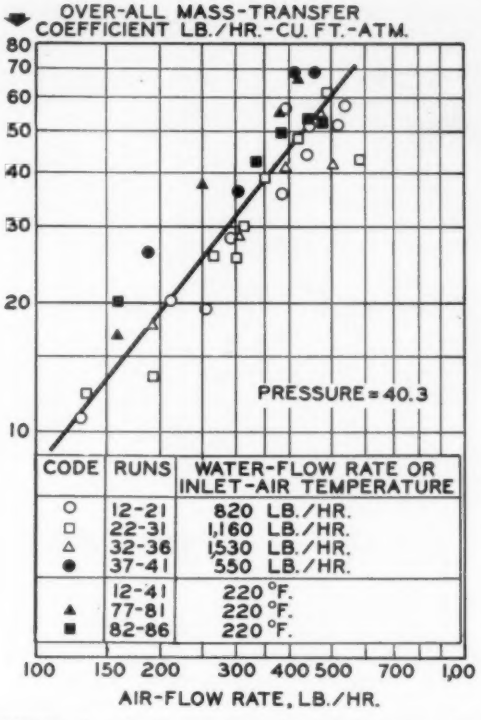
where:

F = air-flow rate, lb./hr.
G = mass-flow rate of air, lb./hr.-ft.^{2}
P = pressure, atm.

The over-all mass-transfer coefficient and, in this case, the gas-film mass-transfer coefficient were found to be a function of the air-flow rate and the column pressure. No consistent effect of temperature or liquid flow rate was observed.

Fig. 11 is a plot of the over-all mass-transfer coefficients calculated from the data taken to determine the effect of liquid-flow rate and temperature. Fig. 12 shows the inverse effect of pressure on the over-all mass-transfer coefficient. The mass-transfer coefficients can be correlated by the following equation:

$$K = 0.0448\,(G)^{1.4}\,(P)^{-3.51} \qquad (12)$$



EFFECT of water-flow rate and inlet-air temperature on the over-all mass-transfer coefficient. Fig. 11.

Summary

The over-all and liquid-film heat-transfer and the over-all mass-transfer coefficients were found to be functions of the gas-flow rate and the column pressure, and to be independent of the liquid-flow rate and inlet-air temperature.

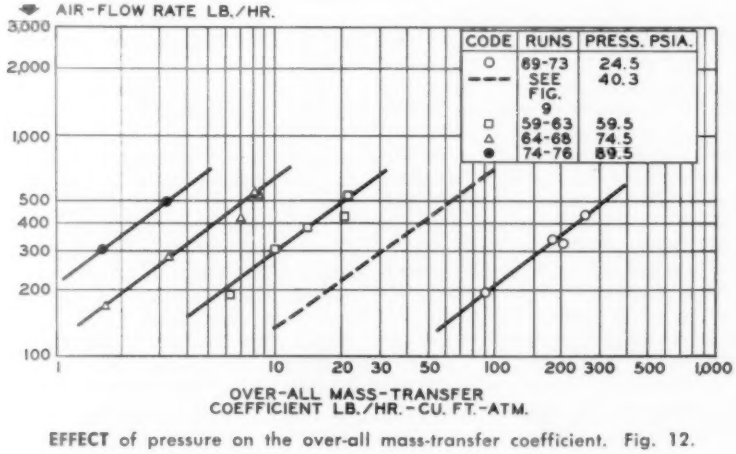
The gas-film heat-transfer coefficient was found to be a function only of the air-flow rate.

The data indicate that in all cases, within the range of study, the major mode of heat transfer was by convection. The amount of heat transferred by evaporation was no more than 30% of the total at the lower pressure, while at higher pressures the amount of heat transferred by evaporation was negligible.

The data, likewise, indicate that the gas film was the major resistance; however, the liquid-film resistance was large enough not to be neglected, particularly when operating at low pressures up to 3 atm. of pressure.

Acknowledgment

The authors express appreciation to Maloney-Crawford Tank & Manufacturing Co., of Tulsa, for its support of the graduate fellowship and to Kimray Co., of Oklahoma City, for providing several control valves.



EFFECT of pressure on the over-all mass-transfer coefficient. Fig. 12.

Nomenclature

C_{pa}	= specific heat of air, B.t.u./lb.-°F.
C_{pv}	= specific heat of water vapor, B.t.u./lb.-°F.
C_{pw}	= specific heat of water, B.t.u./lb.-°F.
F	= air-flow rate, lb./hr.
G	= mass flow rate of air, lb./hr.-sq. ft.
H	= enthalpy, B.t.u./lb.
M	= inlet-air-flow rate, lb./hr.
M_a	= dry-air-flow rate, lb./hr.
M_{vi}	= mass water vapor in inlet air, lb./hr.
M_{vo}	= mass water vapor leaving, lb./hr.
M'	= mass water transferred, lb./hr.
P	= column pressure, atm.
Q	= total heat transferred, B.t.u./hr.
T_i	= temperature of inlet air, °F.
T_o	= temperature of exit air, °F.
T*	= interface temperature, °F.
T_{avg}	= $(T_i + T_o)/2$
t_i	= inlet-water temperature, °F.
t_o	= exit-water temperature, °F.
t_{avg}	= $(t_i + t_o)/2$
U	= over-all heat-transfer coefficient, B.t.u./hr.-ft.^{3}-°F.
V	= tower volume between plates, ft.^{3}
v.p.	= vapor pressure, atm.
h_ga	= gas-film heat-transfer coefficient, B.t.u./hr.-ft.^{3}-°F.
h_ia	= liquid-film heat-transfer coefficient, B.t.u./hr.-ft.^{3}-°F.
K_ga or K	= gas-film or over-all mass-transfer coefficient, lb./ft.^{3}-hr.-atm.
λ	= latent heat of vaporization, B.t.u./lb.

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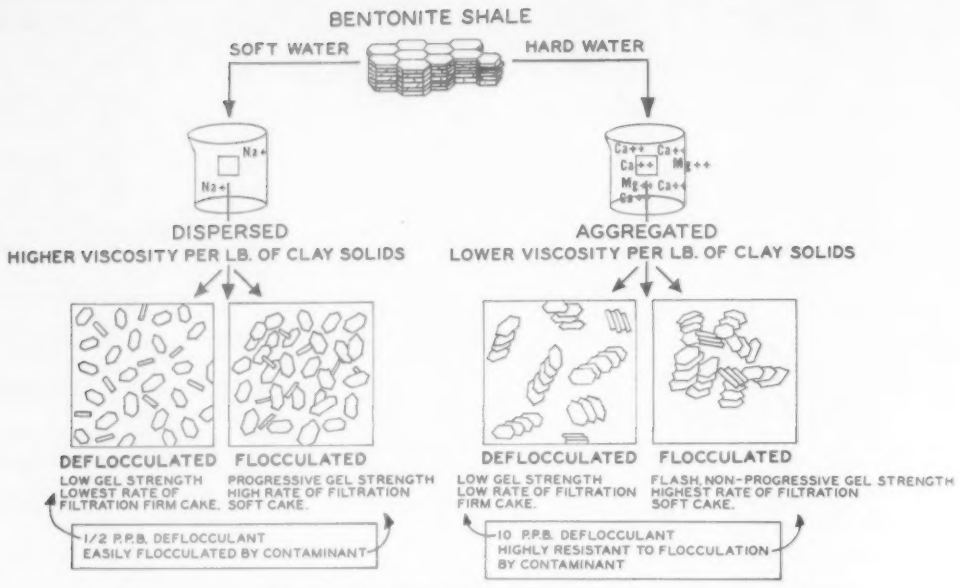


BEST MUD CONDITION means high aggregation of deflocculated particles. Diagram is simplified in that there is some overlap in the physical states. Fig. 1.

New calcium-treated muds slash

There has been a minor revolution in drilling mud in South Louisiana during the past 2 years. New inhibited muds are paying big dividends in low mud costs and lower over-all drilling costs. This article describes these inhibited muds and others currently in use in this important drilling area.

BY J. A. GILL AND W. M. CARNICOM
Baroid Division, National Lead Co.

SOME 70% of the muds used today in coastal Louisiana are calcium-treated, that is, either lime, calcium chloride, gypsum, or seawater.

The majority of these are the new, more highly inhibited types. Moreover, the move toward these systems seems to be accelerating. As a result of their use, mud costs in the area are drastically lower than in times past, and deeper wells are drilled with less trouble than possible heretofore.

The trend is away from the lime mud which served South Louisiana for so long. This is due to several factors. First is the inherent instability of the high-pH lime muds at high temperatures[1]. Second are the many benefits offered by greater inhibition in the newer mud systems. These benefits include better hole condition, less viscosity increase from drilled solids, greater tolerance for contaminants, and less damage to productive sands[2 3 4]. Another reason for the trend away from lime muds is the introduction of a chemical thinner which is capable of maintaining effective deflocculation even in the presence of high concentrations of the various inhibiting salts.

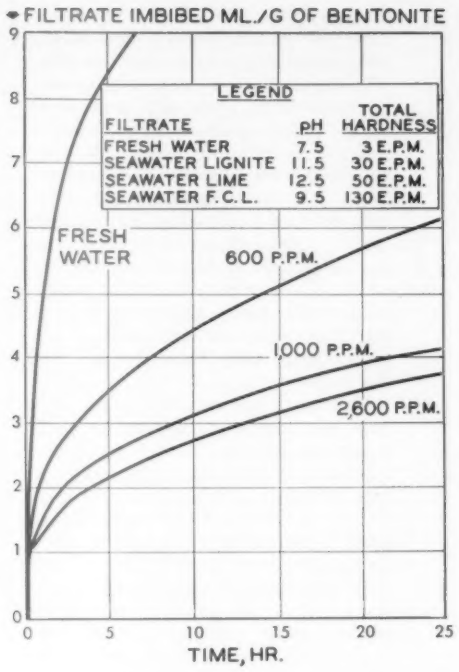
This chemical thinner, ferro-chrome lignosulfonate, is marketed under the trade name Q-Broxin.

This article is a condensation of a paper presented before the Society of Petroleum Engineers of AIME meeting on Gulf Coast drilling and production practice, Lafayette, La.

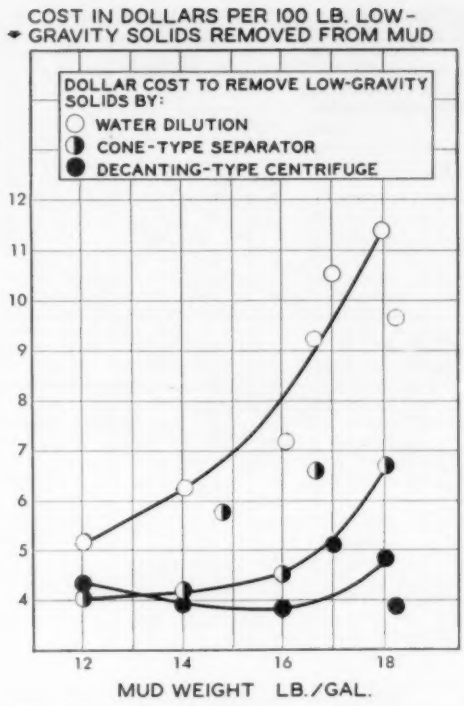
Deflocculant, not thinner . . . Unfortunately, the term "thinner" is very general and the terms "deflocculant" and "dispersant" have been used indiscriminately and interchangeably. To avoid further confusion, let us review the generally accepted nomenclature for describing the various physical states of the clay-water system[5].

Fig. 1 shows the difference in dispersion and aggregation as well as flocculation and deflocculation. This diagram is oversimplified since, in fact, the different states overlap to a large extent.

Present-day mud chemistry is directed toward maintaining deflocculation, not dispersion, in the presence of enough inhibiting ions to give a high degree of aggregation. The authors suggest that the term "deflocculant," long used in the ceramic industry, be adopted in the drilling-mud industry in place of the meaningless term "thinner."


FILTRATE IMBIBED ML./G OF BENTONITE
LEGEND
FILTRATE | pH | TOTAL HARDNESS
FRESH WATER | 7.5 | 3 E.P.M.
SEAWATER LIGNITE | 11.5 | 30 E.P.M.
SEAWATER LIME | 12.5 | 50 E.P.M.
SEAWATER F.C.L. | 9.5 | 130 E.P.M.
FRESH WATER
600 P.P.M.
1,000 P.P.M.
2,600 P.P.M.
TIME, HR.

AS FLUID HARDNESS INCREASES, amount of filtrate imbibed by bentonite decreases. This shows that the highly inhibited muds keep good flow properties even with contamination. Fig. 2.


COST IN DOLLARS PER 100 LB. LOW-GRAVITY SOLIDS REMOVED FROM MUD
DOLLAR COST TO REMOVE LOW-GRAVITY SOLIDS BY:
WATER DILUTION
CONE-TYPE SEPARATOR
DECANTING-TYPE CENTRIFUGE
MUD WEIGHT LB./GAL.

DECANTING-TYPE CENTRIFUGE has high daily rental but is cheapest means of removing drilled solids from all but the lightest of weighted muds. Fig. 3.

South Louisiana drilling costs

Red mud cheapest but limited . . . Table 1 shows the types of mud currently used in South Louisiana. It shows that low-pH red mud is the cheapest for wells which do not require a heavily weighted mud or expect contamination by salt water. When there are no inhibiting ions as in this mud, the cost of chemicals for maintaining deflocculation is very low. However, such a noninhibited mud has little tolerance for solids. The flow properties become costly to manage at mud densities above 12.0 lb. per gallon. As a result, few wells can be drilled in South Louisiana with the low-pH red mud.

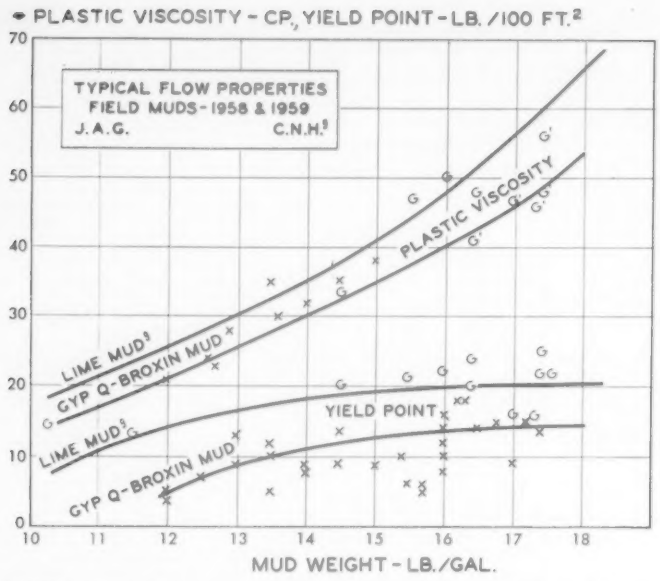
In Gulf Coast drilling, good filtration and good flow properties are necessary even though mud weight is high and contaminants are present. The more or less inhibited muds have proved themselves very practical for these conditions. So, as Table 1 shows, 70% of the muds in use were calcium treated—either lime, calcium chloride, gypsum, or seawater. Of these, 68% are of the recently introduced, more highly inhibited types, containing ever greater concentrations

TABLE 1—SURVEY OF MUD TYPES IN USE—LOUISIANA GULF COAST
(Wells drilling on March 1, 1959)

Mud wt. (lb./gal.)	Low pH red muds		Lime muds (150-300 p.p.m. Ca^{++})		Shale control muds (400-800 p.p.m. Ca^{++})		Gyp Q-Broxin muds (800-1,200 p.p.m. Ca^{++})		Sea-water Q-Broxin muds (1,800-2,400 p.p.m. Ca^{++} and Mg^{++})
	Inshore	Offshore	Inshore	Offshore	Inshore	Offshore	Inshore	Offshore	Offshore
10.0	28		4		7		3		
11.0	20	12	4		2		5		1
12.0	5	1	5	1	11		5	1	
13.0	2		16	1	2	2	7	3	
14.0			3	3	11		5	1	1
15.0			1		1		7	3	1
16.0	1		4		3		3	1	
17.0			7		4		4	1	2
18.0	2		2		4		5	1	
	58	13	46	5	45	2	44	11	5

Total: 229.

Special muds used during recent months included four high-calcium Q-Broxin muds (3,500 p.p.m. Ca^{++}); four barium Q-Broxin muds; and several saturated salt and oil-base muds. Two aerated sea-water muds were used offshore Florida.



THESE VALUES of plastic viscosity and yield point are typical of South Louisiana field muds. Points marked G mean cone-type separator; those marked G′ mean decanting centrifuge. Fig. 4.

of soluble calcium ions. Fig. 2 compares the action of bentonite when exposed to filtrates of increasing hardness[11]. It shows how swelling decreases as hardness i.e., calcium ion concentration) increases.

When does centrifuge pay? . . . The cost of mechanically removing undesirable drilled solids from a mud system depends on: (1) barite discarded in the process, plus (2) chemicals discarded in the process, plus (3) daily rental charges. Usually, these costs are figured on the basis of each 100 lb. of clay solids removed from the mud.

Fig. 3 shows that, in any but the lowest-density muds, the decanting centrifuge is the most economical method of removing solids despite its higher rental rate[12]. For example, consider a mud loaded with drilled solids, perhaps a 15.6-lb. per gallon mud with 35% by volume of solids. It contains 280 lb. per barrel of barite and 150 lb. per barrel of clay. On such a mud, clay removal is easy at first and economical even with a unit of low barite recovery. But, as the clay solids content is reduced and maintained near the desired minimum, the centrifuge must process more and more mud to remove further clay solids.

Barite recovery becomes all-important economically. A unit of low efficiency can discard in barite many times its rental cost each day in attempting to maintain solids and plastic viscosity near the optimum level. In Fig. 4, Well G (cone) and Well G′ (decanting centrifuge) show how inadequate the cone-type separator can be in the heavier-weight ranges.

Dividends in flow properties . . . There are many benefits of operating a drilling mud at its minimum attainable plastic viscosity and yield point[8 9]. Some of these benefits are:

1. Better hole hydraulics.
2. Faster rates of penetration.
3. Less trip gas and hole bridging due to swabbing action.
4. Less pressure surge and loss of circulation on reentering the hole.
5. Greatly reduced mud-maintenance costs.

The trend in recent years has been toward paying much closer attention to flow properties. Fig. 4 shows a curve of plastic-viscosity and yield-point values for various mud weights. This curve is an average and should be used as a guide for maximum rather than minimum target values.

These low values of plastic viscosity and yield point introduce several questions. For instance, should the centrifuge be used less when barite starts settling. The answer is, "Possibly, but not necessarily." There may still be a large quantity of drilled solids in the mud which are of such poor quality that they furnish no suspension or filtration properties. The retort will tell the story.

If such is the case, we might add 5 lb. per barrel of high-quality sack bentonite. This may furnish good suspension and filtration properties at less increase in viscosity than 1 or 2 lb. per barrel of CMC alone. The CMC performs best when some high-quality bentonite is present.

In defense of this once-startling suggestion, we might point out that 5 lb. per barrel of bentonite is negligible in comparison with 50 or 100 lb. per barrel of drilled solids. And, it is scarcely noticeable on the retort (0.5% by volume). Even in highly inhibited systems, the proper type and amount of bentonite is still the basic mud ingredient for suspension and filtration properties. The other additives, which are very necessary, merely build onto the bentonite. Do not overlook the addition of bentonite, when needed, in centrifuging to maintain minimum plastic viscosity.

Another question concerns the yield-point curve. "When should deflocculant treatments be reduced?" If pilot tests show that the addition of more deflocculant reduces the yield point further, then you gain benefits by making that addition. If pilot tests show that maximum deflocculation (minimum attainable yield point) has already been reached, chemical treatment should be reduced until the yield point begins to go up.

Special Additives and Methods

. . . Surfactants. Nonionic surfactants (DMS, DME) have many special applications in today's deep wells. They are being added to gyp Q-Broxin

TABLE 2—TYPICAL WELL RECORDS

Well	Mud type	Depth (ft.)	Cost ($)	Example of:
A	Lime	13,200	94,000	Salt-water flow, stuck pipe.
B	Lime	18,500	227,000	High-maintenance costs.
C	Lime	16,000	52,000	Low cost with centrifuge.
D	Shale control	17,000	124,000	Long duration well, lower costs.
E	Shale control	15,000	40,000	Low-maintenance costs.
F	Gyp Q-Broxin	18,000	74,000	Long duration, undercentrifuged. (Fig. 3).
G	Gyp Q-Broxin	15,500	53,000	Centrifuged, but underdeflocculated. (Fig. 3).
H	Gyp Q-Broxin	16,000	41,000	Centrifuged, deflocculated.
I	Sea water-Q-Broxin	17,000	56,000	Salt-water-flow stability.
J	Sea water-Q-Broxin	13,000	31,000	Good mud and drilling practices.

muds to reduce further the high-temperature and high-pressure filtration rates. They are also added to enhance inhibition and as a special emulsifier in several types of muds. Another special application is to reduce torque and differential-pressure sticking of drill pipe[14,15].

... **E.p. lubricants.** Extreme-pressure lubricants are being widely field-tested in South Louisiana now. Some results are promising, others are inconclusive.

... **Sodium chromate.** This preservative is being used to make shale-control muds even more temperature stable. It is also used in gyp muds to raise the efficiency of CMC.

... **Attapulgite, barite squeeze.** Several operators have consistently gotten good results in restoring lost circulation by using a squeeze of attapulgite and barite[13].

... **Oil-base and invert-emulsion muds.** There is a new suspending agent composed of attapulgite especially processed to render it dispersible in oil. This has been used for suspending barite in oil-base and inverted-emulsion muds where settling was previously a problem.

... **Gyp-attapulgite completion muds.** A packer fluid composed of gypsum, attapulgite, and barite has much better stability at high temperatures than does the bentonite-CMC-barite mud.

... **Gyp FCL completion muds.** Several wells which were completed with a gyp and ferro-chrome-lignosulfonate mud have now been successfully worked over. The muds were circulated out after standing as long as 1 year at 240° F.

... **Solids-free completion fluids.** In the last few years, use of clear-water fluids weighted and inhibited with soluble salts has become widespread. Some of these are:

Salt	Solution density, lb. per gal.
K Cl	9.8
Na Cl	10.0
$Na\ CO_3$	10.3
$Na\ NO_3$	11.6
$Ca\ Cl_2$	12.2
$K_2\ CO_3$	13.0
$Ca(NO_3)_2 + K\ Cl$	14.0
$Zn\ Cl_2$	18.0

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BOOK

APPLIED PETROLEUM RESERVOIR ENGINEERING, by B. C. Craft and M. F. Hawkins, Petroleum Engineering Department, Louisiana State University. Published by Prentice Hall, Inc., 1959. $12.00.

An excellent text for a first course in reservoir engineering. Each topic is introduced in an easy-to-understand manner and is developed to a point of maturity, consistent with today's knowledge of the subject. The book contains a much-needed chapter on gas reservoirs in keeping with the current emphasis on gas production. A liberal supply of problems makes the book a worthwhile addition to the permanent literature.

Nelson Refinery Cost Indexes

Published in the first issue each month in the Engineering Section.

Compiled by W. L. Nelson, Technical Editor, and petroleum refinery consultant, Tulsa.

Charts of the indexes are published each year in a late January or early February issue.

Indexes of selected individual items of equipment and materials are also published on the Costimating page in the first issue of the months of January, April, July, and October.

Refinery Construction Cost Index (1946 Basis):

Explained on page 101 of the issue of August 5, 1957.

	1950	1954	1956	1957	1958	March 1959
Pumps, compressors, etc.	138.2	166.5	192.0	206.7	214.7	226.4
Electrical machinery	134.9	160.0	175.0	188.9	192.7	193.3
Internal-combustion engines	126.0	150.5	164.0	173.9	178.3	178.8
Instruments	127.8	154.6	182.1	187.4	194.9	204.1
Heat exchangers	140.0	171.7	190.7	203.6	181.2	176.4
Misc. equipment average	126.2	160.7	180.5	192.1	192.4	195.8
Materials component	149.5	174.6	190.4	201.9	204.2	207.6
Labor component	144.0	183.3	198.2	208.6	220.4	226.6
Nelson construction index	146.2	179.8	195.3	205.9	213.9	219.0

Refinery Operating Cost Indexes (1956 Basis):

Explained on page 171 of the issue of June 1, 1959.

	1946	1952	1954	1957	1958	Feb. 1959
Fuel cost	49.6	81.0	86.5	112.4	102.6	105.7
Labor cost	73.1	88.7	90.9	106.1	105.0	97.1
Wages	52.4	81.5	88.7	104.1	105.4	109.7
Productivity	68.3	90.2	97.1	98.1	100.3	113.0
Investment, etc. costs	51.2	83.6	92.0	105.4	109.5	112.3
Chemicals cost	37.0	72.1	85.7	102.2	104.4	101.9
Operating Cost Indexes:						
Refinery	58.5	80.5	88.7	106.4	105.9	103.7
Process units	62.9	82.2	88.4	107.1	105.8	103.4

Sea transportation of petroleum

- **In U. S.: 3 to 4 bbl. out of every 10**
- **All foreign (except Iron Curtain): 8 bbl. out of 10**
- **In Europe: 90% dependency on water**

BY LOREN F. KAHLE
Transportation Coordinator,
Standard Oil Co. (N. J.)

AND A. J. KELLY, JR.
Tanker Tonnage Division Head,
Transportation Coordination Department,
Standard Oil Co. (N. J.)

OFTEN oil well and consumer are separated by distances where overland transportation such as pipeline or rail can be used. Taking the United States in total, this is generally the case, for out of every 10 bbl. of petroleum consumption in this country, only about 3 to 4 bbl. go for an ocean ride along the way; this factor allows for both coastwise tanker movements and for the imports of crude oil and products from overseas areas.

Outside the United States, however, the dependency of oil consumers on ocean transport is much greater. Taking the foreign area in total, and excluding the Russian bloc countries, almost 8 bbl. out of every 10 bbl. of oil consumption move along an ocean trade route between oil well and the final customer. In Europe the figure is still higher—over 90% dependency on ocean transport.

Post-World War II Tanker Developments

Of the developments in tanker construction in the period since the end of World War II, most striking is the increase in size compared to the World War T2 type tanker. Speed, however, has only increased slightly over this period.

In the tanker fleet of one oil company, vessels of approximately 27,000 d.w. tons were designed in the early post-World War II days, and the first of these ships which were then called "supertankers" entered service in 1949. One of the advantages of this new design was that loaded draft exceeded that of the T2s by only 2 ft., thus permitting them to enter most ports able to accommodate T2s, while carrying capacity increased about 80%.

This was only the first of many steps taken toward more efficient ocean petroleum carriers. Then still larger vessels went on the drawing boards, and tankers of thrice or more the tonnage of the T2s began to replace them and the other smaller and older vessels in the fleets of the oil companies and independent transportation operators.

In recent years, some operators looking for means of lowering ocean-transportation costs have chosen to jumboize or add new midsections to older vessels, notably the T2s, thus increasing their length, deadweight and carrying capacity. Others have stepped new buildings up to 70,000 d.w. tons or more; a tanker of 104,500 tons was launched in December 1958.

Presented at Fifth World Petroleum Congress, New York.

T2 As a Common Denominator

The world tanker fleet includes vessels varying in dimensions, speeds, and capacities. This wide range of variation makes it desirable to express ocean-transportation requirements and tanker tonnage by means of a convenient yardstick. The most widely used yardstick is the "T2 equivalent" which provides an approximate common denominator for relating the carrying capacity of any tanker, recognizing its size and speed, to that of the 16,600 d.w. tons, 14.6-knot, T2-type tanker previously mentioned. For example, a 26,000-ton, 17-knot tanker is 26,000 × 17.0 divided by 16,000 × 14.6 or 1.8 T2 equivalents.

Oil Demand Versus Tanker Use—1918 to 1958

As shown on Table 1, in 1918 world demand for crude and products (excluding Russian bloc countries) totaled about 1½ million barrels daily of which 67% was consumed in the United States. By 1938 demand had increased to about 5½ million and in 1958 it reached an estimated 16.7 million barrels daily. Today, however, only 54% is consumed in the U.S.A.

During this 40-year period, demand for tanker transportation on the world's trade routes increased from an estimated 168 T2 equivalents in 1918 to 2,558 in 1958. In the first 20 years of this period, oil demand grew 7% per year versus only 6.5% per year for tonnage. In the second 20-year period, demand growth averaged 5.6% per year and tonnage averaged 7.6% per year.

The data in Table 2 compare oil demand and tonnage growth patterns over the recent past, 1950 to 1958. Oil demand grew from slightly over 10 million barrels daily in 1950 to 16.7 million barrels per day in 1958 or 6.6% per year. During the same 8 years, tanker demand more than doubled and rose from 1,217 to 2,558 T2 equivalents in 1958, a gain of 9.7% per annum.

The reason for the greater growth rates in tonnage utilization in recent years, compared to demand itself, lies in the changes that have occurred in the source of supplies. Prior to World War II, Europe was largely supplied with products from refineries in the Western Hemisphere. Now many new refineries have been built in Europe to process crude from the prolific Middle East fields.

Thus, the whole pattern of supply has gone through a radical change.

TABLE 1—OIL DEMAND VS. TANKER USE—1918 TO 1958

	World oil demand (excl. Russia) 1,000 bbl. per day	Tanker tonnage used T-2 equivalents	Unit tonnage requirements T-2 equiv's. per 1,000,000 B/D
1918	1,469	168*	11.4
1938	5,632	587*	10.4
1958	16,734	2,558	15.3

	Average annual growth rates	
	Oil demand	Tonnage used
1918 to 1938	7.0 %/Yr.	6.5 %/Yr.
1938 to 1958	6.5 %/Yr.	7.6 %/Yr.

*Estimated.

As shown in Table 2, in order to satisfy increased oil demand in the United States during 1950 to 1958, 9.6 T2 equivalents of additional tanker tonnage were needed for each 100,000 bbl. per day of new demand. Outside the United States, this "unit tonnage requirement" was 26.5 T2 per 100,000 bbl. per day of new demand. Thus, in recent years, industry outside the United States has utilized nearly three times the tanker transportation of this country in obtaining its new supplies, due to the long hauls from supply sources to consuming areas.

Current Pattern of Ocean Tanker Movements

The relative dependency of various areas of the world on marine transportation is indicated in the following tabulation which shows the per cent distribution of world-oil demand and ocean tanker utilization by discharging areas for 1957:

	% of World (1957)	
	Total oil demand by areas	Tanker utilization to areas
U.S.A.	55%	25%
Canada	5%	3%
Latin America	9%	9%
Europe	18%	43%
Other Eastern Hemisphere	13%	20%
	100%	100%
	16,000,000 B/D	2450 T-2

Thus in 1957, while consuming 55% of the world's oil, the United States utilized only 25% of the tankers. Conversely, Europe utilized 43% of the world's tankers while consuming less than one-fifth of the oil (18%). Another way of looking at the current-day marine flow pattern is to analyze tanker trading by loading areas. Again looking at 1957, tanker utilization was distributed as follows:

Tankers loading in:	Utilized % of world tanker fleet
Western Hemisphere	39%
Eastern Hemisphere	
Eastern Mediterranean	5%
Persian Gulf	47%
Far East	4%
Transhipments	5%
Total	100%

These statistics reveal the importance of various petroleum-exporting areas in 1957 insofar as tankers moved supplies outward to world markets. In 1957, for example, 47% of the carrying capacity of the world's tanker fleet loaded in the Persian Gulf for world-wide destinations.

Combining loading and discharge areas to give a breakdown of specific trades, the following routes stand out:

Trades	Tanker utilization (1957) T2 equivalents	% of total
U.S. Gulf/East Coast U.S.	225	9
Latin America/U.S. & Canada	222	9
Middle East/U.S. & Canada	169	7
Western Hemisphere/Latin America	136	6
Western Hemisphere/Europe	288	12
Persian Gulf/Europe	608	25
Eastern Mediterranean/Europe	109	4
Persian Gulf/East of Suez	282	11
All Others, Including Trans-shipments	411	17
Total	2,450	100

In this comparison, the Persian Gulf-to-Europe trade stands out as the most important single movement, employing 25% of the world fleet in 1957.

Tanker Size and Transportation Costs

At the end of World War II, the largest tanker in general use was the T2 tanker of 16,600 d.w. tons. The largest tanker operating today, 85,000 d.w. tons, can move crude at approximately 40% of the unit transportation cost of the 16,600 tonner. Today's average-size tanker is approximately 19,000 d.w. tons, with unit transportation costs about 90% of the T2.

The following tabulation and Fig. 1 illustrate this development of today's lower-cost ocean transportation and also gives us a directional insight into the potential for even further reduction. These cost index numbers do not include inflationary effects, but they reflect a common basis for operating costs and investments.

For the purpose of this comparison, the operating cost of a T2 has been taken as 100 units; all other vessels are referred to this base. Of course, operating costs of individual tankers vary widely for a number of reasons, including factors influenced by flag of registry.

Regarding the future, these cost indexes show that as the vessel size increases, the unit transportation cost

TABLE 2—WORLD OIL DEMAND AND OCEAN TONNAGE UTILIZATION DURING PERIOD 1950/1958

	Oil Demand		Tonnage Utilization			T-2 per 100,000 bbl./day of incremental demand 1958-50
	1,000 bbl./day	% Increase vs. prev. yr.	T-2	% Increase/ (Decrease) vs. prev. yr.	T-2 per 100,000 bbl./day of demand	
United States						
1950	6,507		427		6.6	
1951	7,041	8.2	396	(7.3)	5.6	
1952	7,280	3.4	445	12.4	6.1	
1953	7,604	4.5	476	7.0	6.3	
1954	7,760	2.1	473	(0.6)	6.1	
1955	8,460	9.0	545	15.2	6.4	
1956	8,779	3.8	569	4.4	6.5	
1957	8,797	0.2	617	8.4	7.0	
1958*	9,025	2.6	668	8.3	7.4	
1958 Vs. 1950 Increase	2,518	4.2/Yr.	241	5.7/Yr.		9.6
Outside U.S.A.						
1950	3,553		790		22.2	
1951	4,096	15.3	959	21.4	23.4	
1952	4,380	6.9	1,047	9.2	23.9	
1953	4,731	8.0	1,135	8.4	24.0	
1954	5,291	11.8	1,278	12.6	24.2	
1955	6,027	13.9	1,466	14.7	24.3	
1956	6,773	12.4	1,658	13.1	24.5	
1957	7,173	5.9	1,833	10.6	25.6	
1958*	7,709	7.5	1,890	3.1	24.5	
1958 Vs. 1950 Increase	4,156	10.2/Yr.	1,100	11.5/Yr.		26.5
Total World						
1950	10,060		1,217		12.1	
1951	11,137	10.7	1,355	11.3	12.2	
1952	11,660	4.7	1,492	10.1	12.8	
1953	12,335	5.8	1,611	8.0	13.1	
1954	13,051	5.8	1,751	8.7	13.4	
1955	14,487	11.0	2,011	14.9	13.9	
1956	15,552	7.4	2,227	10.7	14.3	
1957	15,970	2.7	2,450	10.0	15.3	
1958*	16,734	4.8	2,558	4.4	15.3	
1958 Vs. 1950 Increase	6,674	6.6/Yr.	1,341	9.7/Yr.		20.1

* Estimated.
NOTE: Statistics exclude Russian bloc Countries.

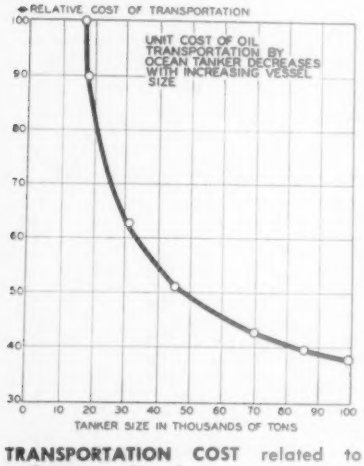
decreases rapidly. For example, with an average fleet of 30,000-d.w. ton, vessels, the transportation costs per unit quantity of oil carried would be approximately 63% of those obtained with a fleet of T2's.

Vessel	Relative Cost of Oil Transport
16,600 d.w. tons (T-2)	100
19,000 d.w. tons	90
30,000 d.w. tons	63
45,000 d.w. tons	51
70,000 d.w. tons	43
85,000 d.w. tons	40
100,000 d.w. tons	38

The average size vessel hauling crude in the future is expected to be appreciably larger than the average of the tanker fleet in service. Clean product vessels and specialized coastwise service will require the smaller vessels which are included in the average. Many very large tankers will be in operation. For example, whereas today's fleet contains only 12 vessels or 54 T2 equivalents in the 50,000-d.w. ton and over class, new construction data indicate plans and orders for 64 vessels or 292 T2 equivalents in this class. These very large tankers should provide transportation costs of 40 to 50% of a T2.

It is difficult to say just what portion of the world's oil will ultimately be transported in these very large tankers, but certainly a high percentage of the crude oil will be carried by them. The incentive to improve port facilities to receive the very large tanker is appreciable, where large volumes are to be handled. There will be cases where the extraordinarily high port facility costs and/or the small requirements involved, will prevent their justification.

It should be noted, from the preceding tabulation and Fig. 1, that, although unit operating costs for tankers continue to decrease with increased size, the advantage gained per deadweight ton increase becomes less as the tanker gets larger and larger. Also, in establishing the optimum size tanker for a given service one must consider the added investments required for improvements in harbor and terminal facilities to handle each larger-size vessel.



TRANSPORTATION COST related to tanker size. Fig. 1.

Another significant factor influencing the forward thinking of marine planners is the future possibilities for tankers transmiting the Suez Canal. Presently the maximum permissible loaded draft is 35 ft., but the Suez Canal Authority is proceeding with the necessary widening and deepening steps to permit a planned 37-ft. draft by 1960-61. Beyond this, there has been talk about the so-called Nasser plan which, in its entirety, might provide a completely two-way canal permitting even the very largest tankers to transit on full draft.

Port and Channel Problems

In spite of the trend to larger vessels, it is likely that in the early years the very largest ones will be limited to relatively few ports, due to comparatively shallow channel depths and approaches. However, tremendous interest is developing in improving the mooring of such tankers in exposed locations.

One possibility now under study is a monomooring system which would enable very large vessels to be moored by the bow to a platform or buoy for loading or discharging about which they would be free to swing so as to lie with minimum weather stress. The thought is to construct such mooring systems offshore from large ports where the heavy expenditures for necessary channel and dock improvements are not economically justified, and connect them to shore terminals with undersea pipelines.

Improvements Abroad Ships

The increase in tanker size has stimulated great improvements aboard ships themselves, in such respects as increases in speed and power, maneuverability, and pumping capacity. Owners are looking to a cargo discharge time of 10 to 12 hours. Loading rates of about 30,000 bbl. per hour have commonly been considered the safe maximum, but, with recent improvements in ships and shore facilities, rates are looked to in the order of 40,000 bbl. per hour.

Tanker builders and operators also are making major advances in the carriage of bulk liquids other than conventional crude oil and products. One such interesting project under way is a 35,000-ton tanker for the simultaneous transportation of liquefied petroleum gas, and fuel and crude oils.

LPG, under pressure, will be carried in cylindrical tanks installed in the wing and center cargo tanks. The discharge and loading of LPG and fuel oils will be accomplished by separate cargo systems and pump rooms. A second vessel on the same company's drawing boards is an LPG, fuel, and crude tanker in which propane will be carried in liquid state under refrigeration. The product would be carried at minus 45° F. in tanks installed within cargo tanks which will be loaded with fuel oil at plus 135° F. Another interesting development is the large increase in road building and the consequent increased demand for asphalt. This demand, in turn, has created a need for specially designed vessels to transport penetration asphalt because of the different characteristics of the materials.

Outlook for Nuclear-Powered Tankers

Among the possible tanker advances now on the horizon, none is more intriguing than a nuclear-powered vessel. Many design and economic studies have been and are being made, but at this writing no firm plans for construction of a nuclear tanker have been announced, with the possible exception of one proposal in Italy mentioned in the press last summer. The big unanswered question is: Can a nuclear-powered tanker operate competitively compared to a conventional steam or diesel powered tanker?

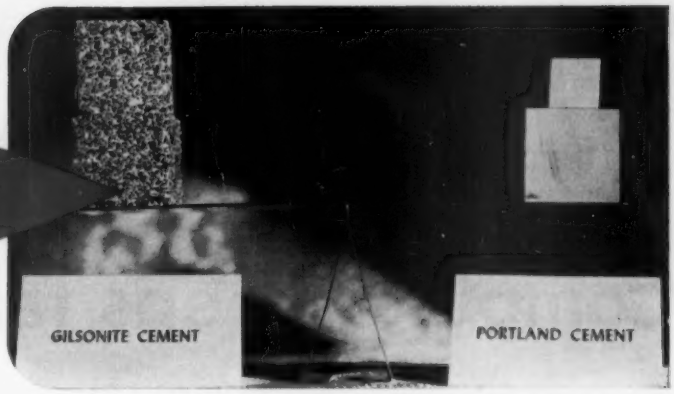
Excluding the reactors, the propulsion system of a nuclear vessel is expected to be about as expensive as that of conventional ships. Consequently, the cost of the reactor itself represents the additional investment for nuclear over conventional fueled shipping.

Thus, in a tanker, the advantages of reduced space for fuel storage and, hence, increased cargo-carrying capacity plus the expected lower nuclear fuel costs would have to offset the higher reactor investment to enable the nuclear vessel to compete with the large modern steam and diesel tankers now operating and planned for the future.

At the Nuclear Merchant Ship Symposium held in Washington, D. C., last summer, one comprehensive case study of nuclear shipping economics indicated that by 1965 nuclear shipping will be only 30 to 35% more expensive than conventional shipping.

The "NS Savannah" now under construction in the United States, is expected to demonstrate the practical feasibility of the sea-going nuclear-powered propulsion unit starting in 1960.

GILSONITE CEMENT...



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"CONTINUE TO LOOK TO HALLIBURTON FOR LEADERSHIP"

In this and in the following article by Landes and Walker, Champlin Oil & Refining Co. tells how use of a computer has been of help in guiding manufacturing operations.

Computer keeps tabs on profits

BY LEE A. WHITNEY
Vice President-Refining
Champlin Oil & Refining Co.
Fort Worth

IF THE REFINER is to maintain his profits at optimum, he must be in position to determine rapidly the effect of any operations change on cost, product yield, and sales revenue. The recognition of this problem and the obvious need for speed were principal factors leading to the acquisition of a digital computer at our refinery.

● Profit in a manufacturing operation may be defined as the difference between sales revenue and all costs of producing, distributing, and selling the product or products of the operation. Optimum profit is simply maximum profit for any given set of conditions. Basically, then, the problem of optimizing profit reduces to one of maintaining the highest possible sales revnue and the lowest possible cost of operation. When these two objectives are achieved we have profit at its maximum or optimum for the then current conditions.

● The two categories with which we are to deal are costs and sales revenues. These are both familiar terms and the fact that we wish to maximize sales revenue and minimize cost is also in accordance with well-established principles. Specifically, we are going to examine some of the problems associated with maintaining minimum cost and maximum revenue for a medium-sized petroleum-refining operation.

Enid Refinery

The particular refinery which will form the basis for this discussion is a nominal 30,000 bbl. per day operation located at Enid, Okla. Within the past 4 years, the refinery has been completely revamped and modernized. It is equipped with two crude units, fluid cat cracking, catalytic reforming, cat poly gasoline facilities, hydrofluoric acid alkylation, lubricating-oil manufacturing and packaging facilities and asphalt manufacturing.

Standard products manufactured in these facilities number 209, and range from liquefied petroleum gases through aviation and motor fuels to road-building materials. Products leave the plant by motor transport, railroad box and tank cars, by company-owned products pipelines going south 85 miles to Oklahoma City and north some 500 miles to Rock Rapids, Iowa, and by the Great Lakes Pipeline System which receives products at the refinery.

Distribution of products ranges south to Texas, north to the Canadian border, west to the Rocky Mountains and east to the Mississippi. This entire area is predominately agricultural. Market conditions, therefore, are often completely different from those in the more heavily populated industrial areas.

The actual solution of this problem of figuring optimum profit which we finally developed is completely unpretentious. Basically, it involves three major steps:

1. A complete material accounting based on crude run.
2. Development of the minimum cost of operations for specified conditions together with detailed unit cost of all products.
3. Computation of the total gross margin as well as individual product margins.

Material Accounting

In preparing the material accounting, preparation of daily inventories and transfer schedules has been speeded up by the use of IBM cards. The use of the cards was premised on the elimination of tank tables and substitution of a barrel coefficient per foot of tank height.

Punched Cards

These cards are prepunched with all necessary information except the actual gager's notation. All of these prepunched cards with the actual gages written thereon are forwarded to the office between 7 and 7:30 each morning. The gage information is punched into the card and verified and the cards then go to a 604 IBM computing punch for computation of the net barrels. When all cards have been processed, they are run through the tabulating machine and the completed printed inventory and transfer statement is available.

The time saving achieved by use of cards for this purpose may be illustrated by the fact that this completed inventory and transfer statement is back in the hands of the chief gager for checking by 8:30 in the morning. Copies of the checked statement are available to refinery accounting and operating groups by 9 to 10 o'clock each day. Not only has this method of handling inventory at the refinery made information available quickly but it has likewise greatly increased the reliability of the information. Thus, gross operating difficulties come to light quickly and steps may be taken to correct them properly.

Checking Weight Balances

The information contained in this inventory and transfer report, together with laboratory analyses and necessary meter readings throughout the refinery, form the basis for our next most important job in material accounting, that of checking weight balances through each unit at the refinery. Before changing our inventory procedure, material balances around individual units in the refinery were usually confined to periodic spot checks unless obvious volumetric discrepancies showed in the daily inventory. Volumetric accounting in a refinery is most unsatisfactory since there are wide differences in gravity of the materials.

The amount of effort, however, required to produce daily weight balances around each of the units was such that not much could be done with existing personnel even though the need was recognized.

Daily material balances . . . With the

From paper presented at annual meeting of American Association of Cost Engineers, Cleveland.

CHAMPLIN OIL & REFINING CO.

24 Hrs. Ending
6 A.M. 6-1-58

PLATFORMER UNIT

FILE: 86-574-000-100

CHARGE: 3200	TODAY	CUM.	RVP	CL + 3 cc
Bbls.	2976.0	65266		39.0
Lbs.	788640.0			
RECOVERY:	.0			
Bbls.	2853.0	60221	5.0	74.2
Vol. %	95.8	92.27		89.4
Vol. % Corr.	99.3			
Lbs.	767457.0			
Wt. %	97.3			

FUEL GAS & LPG:	TOTAL	SEP. GAS.	STAB. GAS	GAS to F.C.C.
Cu. Ft. (M)	1750.0	1623.0	107.0	.0
Btu's (MM)	.0	700.7	197.7	.0
Btu's Cu.Ft.	.0	431.7	1847.6	.0
Lbs.	26508.0	17573.2	8934.8	.0
Bbls. C3"	.0	.0	.0	.0
C3	56.2	17.4	38.8	.0
C4"	.0	.0	.0	.0
IC4	5.5	3.9	1.6	.0
NC4	5.6	5.5	.1	.0
C5+	5.5	5.5	.0	.0
Total Bbls.	72.8	32.3	40.5	.0
Cu.Ft. Bbls.	581.2	545.3	35.9	.0
Wt.%	3.3	2.2	1.1	.0

% Recovered	100.675
$/Value Bbl.	4.419
$ Variance	32.736
	OK

Cat. Life	541	Water in Charge			0
		Heater #1 Inlet			622
#1 Reactor In	885	Dichloride in Reactor Chg.			a
T	71	Recycle Rate MMSCF/D			30.9
#2 Reactor In	881	H_2HC Ratio			1.07
T	35	Density Rec. Gas			.153
#3 Reactor In	876	Density Stab. Gas			1.01
T	15	H_2S Recycle Gas			-
Total T	121	H_2S Stab. Gas			-
		Dist:	Plat.		Naphtha
Com. Disch. P.	518	API	52.2		55.1
Separator Press.	452	IBP	111		230
Stab. Pressure	250	90%	325		331
Clay Tower Press.	77	EP	399		370
Amps. Comp. Motor	67	% Over @ 212° Separator Inlet	11.0		- 87

Date of Analysis: Sep. Gas 5-28-58
Stab. Gas 5-28-58
Gas to FCC None

TYPICAL MATERIAL-BALANCE REPORT. The gasoline-pool requirements are examined to determine the quantity of naphtha which must be platformed to provide the lowest possible over-all unit costs. Fig. 1.

acquisition of a medium-sized high-speed digital computer at the refinery, however, it became possible to consider daily material balances. Accordingly, all of the information contained in the inventory transfer report plus, as noted above, supplementary meter and laboratory data are now fed to the computer each day to produce a material-balance report (Fig. 1). Generally speaking, the data necessary for these computations go to the office about 10 o'clock in the morning. The computation is made directly on the form, in-putting necessary data by the flexowriter and computing and typing out the finished form. We also show a dollar value in a small box to the left middle portion of the form. This number represents a standard value for platformate in terms of its use in finished gasoline. So long as this value is slightly above or equal to our standard unit, we know that operations are satisfactory. Any deviation from satisfactory operations is indicated in an immediate decline in this value resulting in an indicated daily loss. We find that this negative dollar figure is a much more effective flag than a simple statement showing a yield or quality loss.

The daily weight-balance forms have been applied to the light-end section of the refinery completely and to the over-all refinery with all lubricating-oil manufacturing combined. All of these forms, in general, are back at the refinery and in the hands of the accounting and operational people by noon.

Use of IBM cards for gaging reports and machines for necessary computation have, therefore, made a complete picture of operations available to refinery personnel in a reasonable time. This prompt material accounting has been invaluable in preventing unnecessary loss or contamination of products in the refinery.

Complete Cost Accounting

For Step 1 in this computation of optimum profits crude oil is separated into the appropriate fractions for the particular crude run desired. Each of these fractions is then carried forward either to finished goods or to further processing. Simultaneously with this material accounting, Step 2, a complete cost accounting for the particular set of conditions is made. This accounting follows the exact procedure used in developing our monthly statement.

The dollar items of expense are separated into fixed and variable expenses which are then spread over each of the products in accordance with the material balance. During the course of these computations, the gas oil charged to the cat cracker is determined and the conversion level and the product distribution from the cat cracker are arbitrarily set in accordance with the excess capacity, if any, or with the need for burning oil.

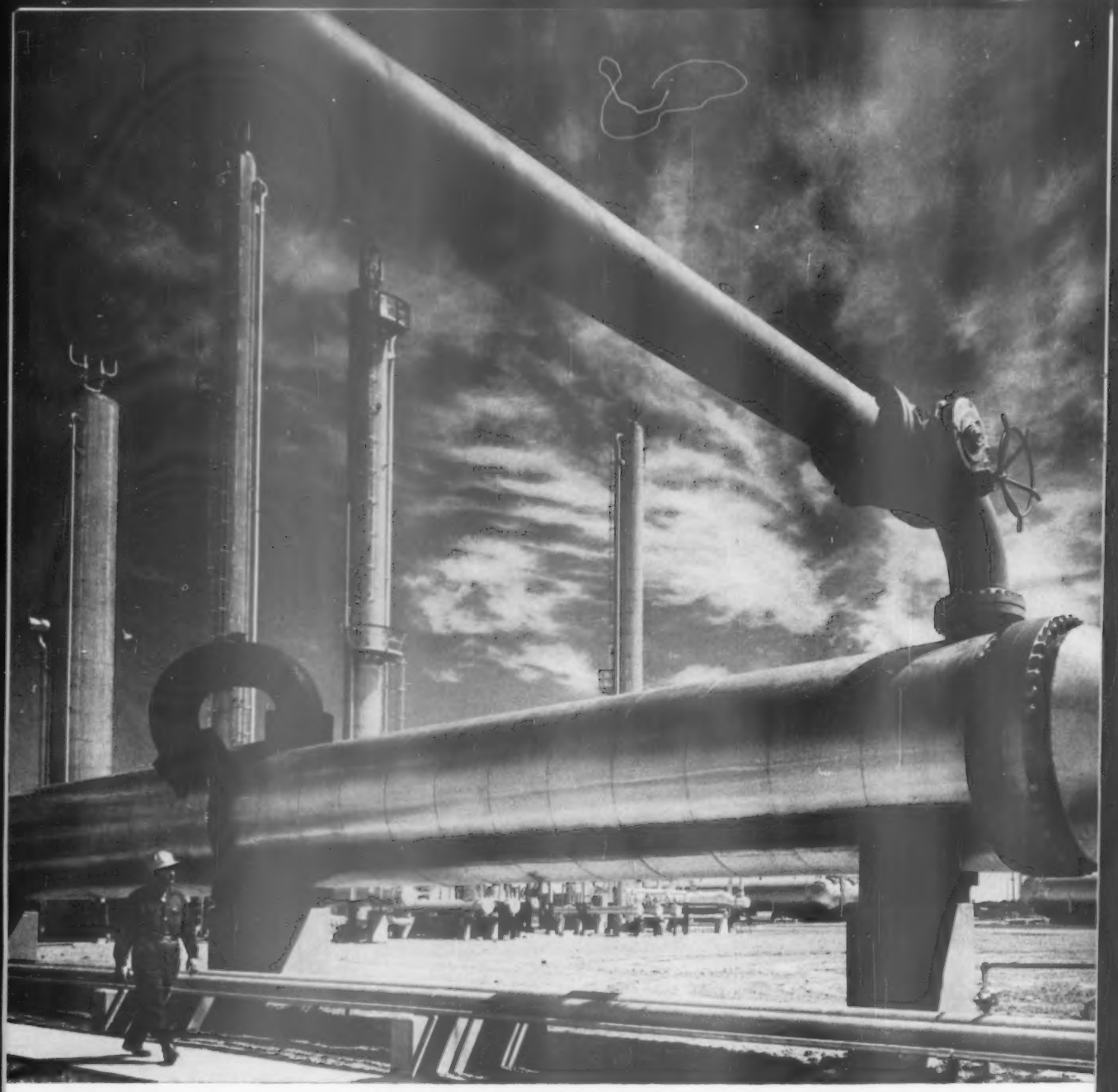
Figuring the Platformer

For the Platformer operation, an arbitrary severity level is chosen. The gasoline-pool requirements for octanes, vapor pressure, and lead are then examined to determine the quantity of naphtha which must be platformed in order to provide the lowest possible over-all unit costs. Vapor pressure of the gasoline pool developed during these computations is adjusted to meet the desired level by addition of the proper quantity of butane. All refinery butane is first used to meet this vapor pressure and in the event more butane is needed, it is purchased at the current delivered price in Enid.

In general, the over-all cost of refinery operation plots as a minimum point curve against naphtha charged to the Platformer. Thus, in the above computations we are actually determining the minimum point on this curve. The problem is so set up that

THE AUTHOR

Lee A. Whitney, Jr., is vice president-coordinator of manufacturing and sales for Champlin Oil & Refining Co., Fort Worth. He joined the company in 1954 as assistant to vice president-refining, following service with U. S. Industrial Chemicals, Inc., and U. S. Industrial Alcohol Co. in technical-development activity. He holds a B.A. degree from University of Rochester.



The extraction plant of Runnels Gas Products Corporation at Eunice, La., processes more than 300 mmcf. of pipeline gas daily to yield 5,000 barrels of liquid hydrocarbons (all the natural gasoline and butanes, 96% of the propane and 35% of the ethane.) Fuel-gas consumption is less than 3%. Absorption takes place at -40°F.

What's new in gas processing?

Anyone contemplating construction of a natural-gas processing plant, whether its purpose is treating, extraction or a combination of both, must first solve a puzzle with three complex variables. The efficiency and profitability of the plant depend on how well the puzzle is solved.

The first variable is, of course, the volume and composition of the inlet gas stream. The second is the market, if any, for extracted products, and the third is the legal and technical requirements for residue gas.

Major shifts in these variables make it profitable today to design gas-processing plants that differ radically from those built only a few years ago, and to locate them much farther away from the gas fields.

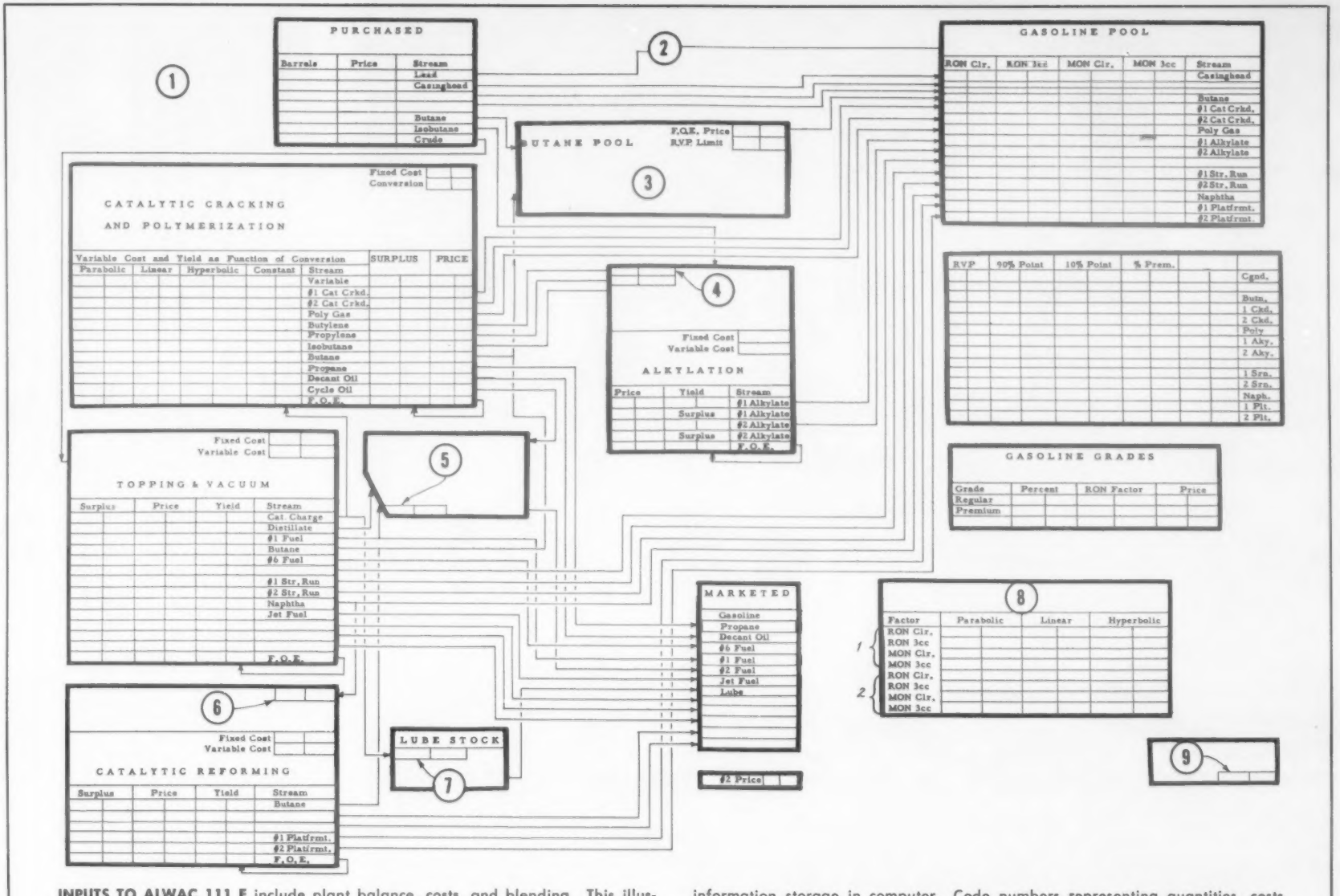
When you consider expansion...
the most important investment you can make
is in the creative ability of men.
FLUOR
Engineers and Constructors

For example, it is now advantageous to build large, highly efficient extraction plants to handle great volumes of lean Louisiana gas. Such plants serve the tremendously expanded LPG market for butanes and propane, and the petrochemical market for both of these, plus ethane. Because of the volume of gas, and the degree of extraction desired, a combination of extreme cold and light-oil absorption is the most efficient way to get the marketable hydrocarbons out. Refrigeration costs are more than offset by the use of smaller quantities of lighter oil, with consequent savings in pumping and stripping capacity.

As the natural-gas industry mushrooms, the trend is toward large plants, not only for hydrocarbon extraction but for sour-gas treating as well. And as the plants grow bigger, new levels of efficiency can be reached through methods that were impractical in smaller installations.

The development of new techniques for large-volume gas processing has been a Fluor contribution to the industry. The combined experience of the gas specialists in Fluor's Los Angeles and Midcontinent divisions represents a pool of advanced know-how that is unequaled anywhere.

The Fluor brochure, "Opportunities in Gas Processing," will be helpful to anyone planning construction of a processing facility. Write to Dept. 44, The Fluor Corporation, Ltd., 2500 South Atlantic Boulevard, Los Angeles 22, California.



INPUTS TO ALWAC 111 E include plant balance, costs, and blending. This illustrates the information on which the complete computation is based and areas of information storage in computer. Code numbers representing quantities, costs, etc., have been omitted to simplify reproduction of this figure. Fig. 2.

NOTES ON FIG. 2

1. The cost of each operating unit is taken to be the variable cost times the number of barrels of charge, plus the value of the charge itself, plus the fixed cost, minus the price of fuel octane equivalent (FOE) times the barrels of FOE, butane, and isobutane produced. This cost is distributed over all other streams in proportion to their selling value, a procedure considered proper only where the cost computations are not to be used for pricing purposes.

2. Enough tetraethyl lead is added to the gasoline pool to bring its research factor up to the weighted average of the research factors of the three grades.

3. Enough butane is added to the gasoline pool, at FOE price, to bring its pressure up to the fixed limit. If not enough butane is produced to do this, more is purchased. Any surplus butane is burned as fuel oil equivalent.

4. These two streams must be matched, in the percentages shown, with isobutane. If more than enough is produced, the surplus goes in the butane pool. If not enough is produced, the rest is purchased. The charge to alkylation is the total of these three streams.

5. The distillate and cycle oil are combined and a fixed per cent, shown at bottom within the box, of their total barrels is taken out of the No. 1 fuel and added to them. This makes the No. 2 fuel.

6. This fixed percentage of the naphtha stream is used as charge to cat reforming.

7. This fixed number of barrels is taken out of the cat charge stock and used as lube stock.

8. If the octanes of No. 1 and No. 2 cat cracked gasolines are found to change with the conversion rate, these correcting coefficients may be used.

9. During blending, the gasoline shrinks to this percentage of its original volume.

three or four points on the curve may be calculated and a least-squares parabolic correlation may be made on these points. The differential of this equation is then set equal to zero and the exact minimum point of the curve computed. On completion of all of these operations, a simple computation of gross and individual product margins is made.

Inputs for computer . . . Fig. 2 illustrates the information upon which the complete computation is based. Actually this is a flow diagram of a sort indicating the areas in which information must be stored in our computer. While all of this information may be changed from time to time as costs vary or as individual unit product yields vary because of processing changes, very few of the inputs need be changed for any given problem.

On completion of any computation, a deck of cards is punched and it is a matter of only a few minutes to reinstate the problem making any changes necessary. The time requirement to reach a minimum cost of operation for any given Platformer severity and crude run is approximately 15 minutes. You can see, therefore, that it is a rather easy matter to pinpoint minimum operating costs.

Computing Margins

The margin computation carried simultaneously is of extreme value. Our marketing area is predominately agricultural and consequently product demand varies tremendously with seasonal agricultural requirements. Very often changing demands for products may be met by varying product distribution in the refinery. Quite often this may result in increased operating costs, but with a considerable increase in gross operating profit. The marginal computation permits us to examine this possibility for any given set of circumstances.

Gasoline Blending

As mentioned briefly above, this whole computation not only produces a material balance, economic balance, and margins of profit, but likewise shows in detail the composition of our total gasoline pool including lead required to meet octanes. The actual blending of these gasoline stocks into two or more gasoline pools is a complicated procedure. All of the gasoline stocks produced each day must be used in blending the required premium and regular gasolines. All of the specifications for distillations, octanes, vapor pressure, etc, must be met. Tetraethyl lead used in meeting octane requirements must be held to a minimum quantity consistent with the requirement developed for the total pool. To check procedure on blending, we are using a linear programing computation.

Linear programing . . . In setting up these problems, restraining equations express the various quantity and quality requirements of each gasoline. These restraints include minimum research and motor octane numbers, maximum vapor pressure, and cubic centimeter, of lead. The matrix size involved in these computations in general runs about 22 by 46. Solution time on the computer ranges from 1½—3 hours. In the final typeout of information from these problems, we take not only an optimum solution but also a complete final tableau printout. This complete tableau is extremely valuable in that it gives us many alternate solutions showing clearly the changes in compositions of gasoline blends which will result from unit changes in the restraints. Additionally, it gives a clear picture of the effect on profit should we decide to use a material, say, in premium gasoline which was not used in the optimum solution.

More Computer Applications

Beyond its use in checking our gasoline blending, we have been and are conducting a planned evaluation of all gasoline stocks using linear programing techniques. In these studies, we assume that we could go out on the open market and buy any or all of our gasoline stocks at our manufacturing cost. We further assume that we might use only as much of any stock as is desirable to use. This, of course, is far from what must be done in practice since all gasoline stocks produced each day must be used. However, this kind of study produces an entirely different picture of the value of many of our stocks at the refinery. We believe that substantial improvements in use of some of the stocks may result from these studies. Actually, they have already proven of considerable value in the study of natural-gasoline use and Platformer operation.

Planned marketing expansion . . . Recently, this same linear-programing technique has been used in the study of a planned marketing expansion. This study involved both the acquisition of business by purchase and the expansion of existing business through construction of new outlets. The entire program was presumed to take place over a period of approximately 5 years and the area of expansion was presumed to be along our own pipeline system and the Great Lakes Pipeline System. The final mathematical

"Projection period varies directly with certainty of sales estimates"

statement of the problem involved 66 restraining equations and 60 unknowns.

Separate sets of solutions were obtained for each increment of marketing expansion. The results of the study were at considerable variance with previous projections and indicated clearly that the direction of expansion would have to be carefully controlled to achieve optimum return on investment. The size of these problems was such that we did not attempt to run them on our own digital machine. The problems were actually run on a large-scale digital computer. Solution time was approximately 20 minutes per increment. The iterations required averaged 63 for each solution.

Control of product inventory . . . Earlier in this paper we mentioned that many of our products moved by pipeline. We have five terminals plus the Enid refinery located on our pipeline system. Total storage is approximately 3,000,000 bbl. Inventories maintained in these terminals and the refinery represent working capital which is relatively unavailable. Obviously, if any of this money could be released for productive use such a move would be desirable. We have, therefore, developed a computation which permits scheduling of deliveries into our pipeline system in such a manner that inventories may be held within desired limits for any particular terminal against any sales estimate. The computation balances refinery production against sales requirements maintaining inventories of all products both at terminals and the refinery at desired levels.

Projections may be made for any specified time interval from a few days to several months. In actual practice, the period of projection varies directly with the certainty of the sales estimates. On the average, a projection is made about every 2 weeks or more often if actual inventories at terminals show much variation with projected inventories. Use of this computation has resulted in substantially lower operating inventories than were previously experienced in spite of increased volume of business. Although the result of such a move is somewhat intangible in terms of optimum profits we do feel that it is a substantial contribution to the over-all problem.

Computers—A Means to an End

In this discussion I have attempted to cover some of the more important problems associated with maintenance of optimum profits with particular emphasis on crude-oil refining and marketing. While we make very substantial use of high-speed computing equipment, I have not emphasized such equipment in this discussion. These machines are, in our opinion, simply a means to an end. The lack of computing equipment is no reason to ignore problems which exist in refining or in any other industry. Once the problem is recognized and a feasible method of solution developed, then high-speed computation may or may not be worth while.

If time is a factor in developing the information, then it is a rather simple matter to code the problem for machine solution. Many facilities exist today throughout the country where computation time may be purchased in event that company-owned facilities are not available. This statement may seem somewhat at variance with other statements regarding the difficulty of getting work on computers. However, all of the work described here was placed on computing facilities in prompt fashion with no increase in personnel.[1] Our computing facilities are run as an open shop and everyone with a problem is encouraged to try his hand at using the computer. Those who are genuinely interested learn quickly to code problems in machine language.

Profit—A Difference Between Two Numbers

Recently, our industry has been plagued with a series of so-called price wars. You will recall that at the beginning of this discussion I defined profit as the difference between sales revenue and all cost of producing, distributing, and selling the product or products of the operation. I further stated that optimum profit is simply maximum profit for any given set of conditions. I would like to conclude this discussion with a warning resulting from some of our experiences in these price wars. Profit is a difference between two numbers. Unfortunately, it may be either positive or negative. When it is negative it becomes very difficult to convince anyone, and particularly management, that profit is indeed at optimum.

Reference

1. Credit for this achievement must certainly go to Byron Horton, manager of computing facilities, Earl Walker, administrative assistant to the manager of refining, both of Champlin, and Allen Beek of the Alwac Corp., manufacturers of our high-speed computing equipment.

Computer used to study wettability

DR. CHARLES G. DODD, Halliburton professor of petroleum engineering at Oklahoma University, is supervising a water-flooding research project under a $5,000 grant-in-aid from the API.

Water flooding is becoming increasingly important to the economy of the oil industry, and whether the rock tends to hold oil to it, or to release the oil and become "water wet" may make as much as 50% difference in the total recovery, according to Dodd.

"If it becomes possible to measure the wettability of a particular rock sample in the laboratory," Dodd said, "more confident predictions of petroleum recovery by water flooding and other operations could be made."

The IBM 650 computer in the OU computer lab is being programed for the first trial runs. If this work is successful, the problem will be switched to the new high-speed computer being built for the school's numerical-analysis lab. Calculations made so far have compared favorably with laboratory results.

After the computer program is established, research work will be done with fresh cores provided by cooperating oil companies. Samples will be cut into a number of pieces, and the physical and chemical properties will be studied. By use of "random number" tables and trial-and-error procedures on the computer, the researchers will get a "wettability number," or probability of entrance, which describes the properties of the rock sample.

The problem is especially complex, according to Dodd, because the internal surfaces of the rock are not all the same in their attraction for either oil or water.

OU scientists are cooperating with Dr. Irving Fatt, who is doing similar work at the University of California. The API liaison man for the OU group is Dr. F. W. Crawford, director of exploration and production research for Phillips Petroleum Co.

BY RALPH LANDES AND EARL WALKER, Champlin Oil & Refining Co., Fort Worth

Computer solves problem of material and economic balance

Digital machine provides the speed necessary to assure keeping abreast of operation changes which affect profit picture in a refinery manufacturing a variety of products

THE DIVERSITY of manufactured products and their seasonal demand presented Champlin Oil & Refining Co. the problem of constantly changing the over-all operating plan to balance marketing requirements. An operating change which was considered to affect only a particular unit might seem profitable but when that change was evaluated with respect to the complete processing structure it could have a negative effect.

Therefore, to correctly evaluate an operating change, a complete material and economic balance was required over the entire refinery. This presented a problem which could be solved manually but the time factor was prohibitive. When management asked for economic evaluation to cover certain possible operating conditions, answers were needed immediately for making decisions.

Paper presented at first Computer Conference of WPRA, at Tulsa, April 8-9, 1959.

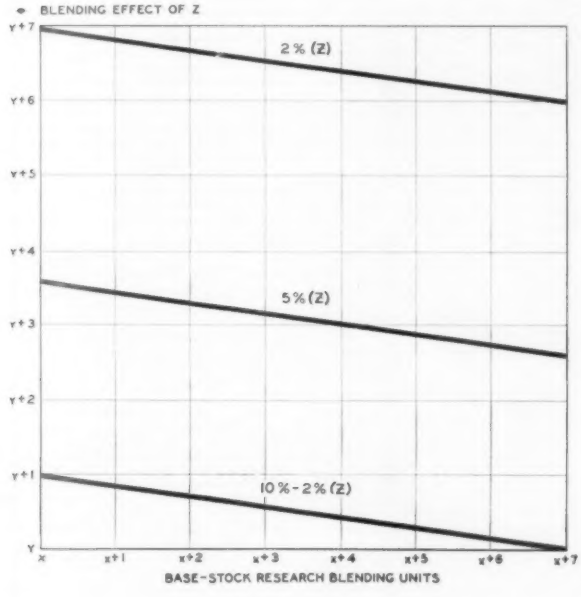
The only possible solution was to set up the problem on an electronic computer. In our case, this idea did not have to be sold to management, but instead management sold the idea to us.

After selecting the machine (Alwac computer), work on the initial problem was initiated. The economic and plant-balances portion of the proposed problem was approached on the conventional basis. Fixed and variable costs as well as unit material balances were developed around each cost center. These factors were then accumulated for the over-all plant balances.

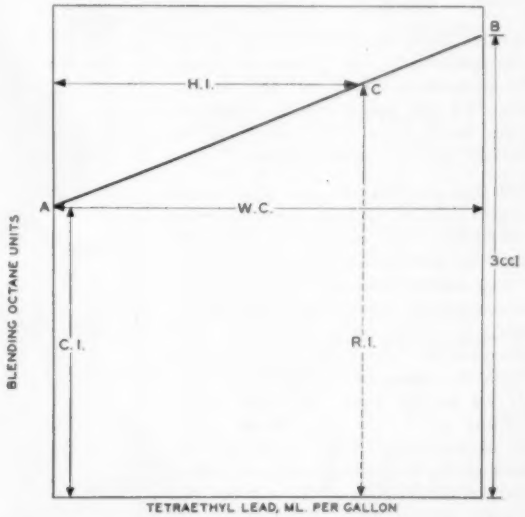
Gasoline blending . . . From these material balances, the quantity of each component available for blending in the gasoline pool or for blending in other finished products is computed. These available quantities take into consideration the different possible severity levels of operation and also reflect the quality of the various streams.

R.v.p. . . . For example, the Reid-vapor-pressure restriction for the gasoline pool is a predetermined input which cannot be exceeded. From the indicated R.v.p. levels of each component which is available for blending in the gasoline pool, the amount of natural or butane which can be added to bring the total pool up to the desired R.v.p. is computed.

At this point, our major problem was determining the tetraethyl lead dosage which would be required for the gasoline pool under different conditions. We have learned that certain



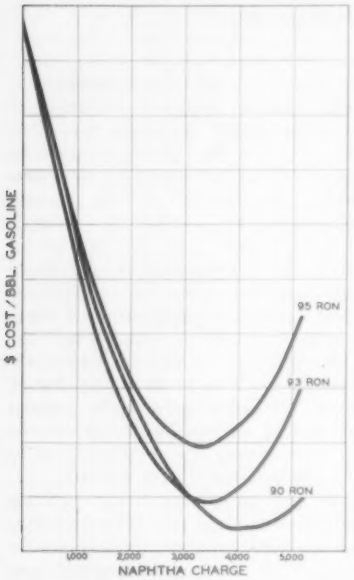
CHANGE OF OCTANE NUMBER for different percentages of a component in the blend. Fig. 1.



LEGEND: A = clear octane units; B = 3 cc. octane units; C = required octane units; C.I. = vertical clear inches; 3 cc. I. = vertical 3 cc. inches; R.I. = vertical required inches; W.C. = width of chart in inches; H.I. = horizontal inches to reach required octane unit level.

REQUIRED LEAD LEVEL is determined by the computer in the manner indicated here. Fig. 2.

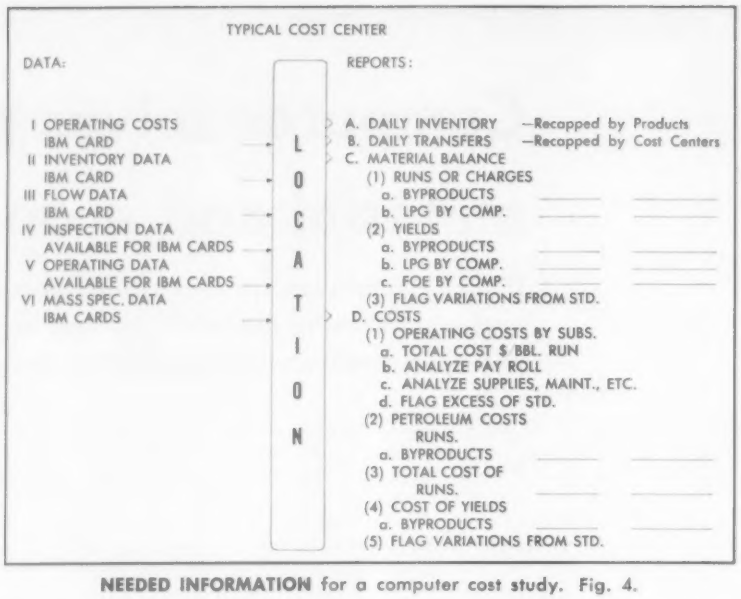
components have a different blending value depending in part upon the per cent of the total blend which they comprise and upon their relation to other components contained in the blend. For example, Fig. 1 represents the change in research octane number (X) and the blending effect (Y) for different percentages of component (Z) in a particular blend. For explanation purposes, we have used an extreme case in order to emphasize the computations. This method gives a blending value for each special component related to other components in the proposed blend. In computing individual TEL levels, the TEL per gallon and blending octane levels have been converted to vertical and horizontal inches.



REFORMING COSTS vary with naphtha charge and research octane number of product. Fig. 3.

Develop coefficients . . . This is accomplished by making a least-squares correlation to develop coefficients used in determining the TEL levels. These coefficients are thereafter used as constants for converting factor units to inches on a lead chart. For components which blend differently from the indicated component in Fig. 1, we simply input the units representing clear and 3-cc. levels prior to computation. Fig. 2 depicts the manner in which the computer solves the required lead level to meet the desired octane levels using the coefficients developed from the least-squares correlation. The lead chart is simulated by the computer in the following manner:

1. A least-squares correlation is made to express the relationship between blending octane units of a component and vertical inches on a lead chart.
2. Utilizing these least-squares coefficients, the clear and 3-cc. blending octane values which were inputed are interpreted in terms of vertical inches on a lead chart.



NEEDED INFORMATION for a computer cost study. Fig. 4.

CHAMPLIN OIL & REFINING CO.

F.C.C. BALANCE File: 86-569-000-100

Ending 6 a.m. Schedule 1-B

DATE_____

CHARGE:		
Fresh	9741.0	Bbl.
Recycle	3264.0	Bbl.
Total	13005.0	Bbl.
Recycle	33.5	Vol. %
	.0	
Fresh	2971005.0	Lb.
Recycle	1015104.0	Lb.
Recycle	34.1	Wt. %
RECOVERY:		
Sec. Abs.	144897.4	Lb.
	4.9	Wt. %
Cat. C3 & C4	531865.3	Lb.
	17.9	Wt.
No. 1 Cat. Gaso.	4143.0	Bbl.
	42.5	Vol. %
No. 2 Cat. Gaso.	410.0	Bbl.
	4.2	Vol. %
Total Gaso.	46.7	Vol. %
	1196447.0	Lb.
	40.2	Wt. %
Lt. Cycle	2120.0	Bbl.
	21.7	Vol. %
	650840.0	Lb.
	21.9	Wt. %
Decant	596.0	Bbl.
	6.1	Vol. %
	197872.0	Lb.
	6.6	Wt. %
Coke	228192.0	Lb.
	7.6	Wt. %
Total	2950113.7	Lb. Recovery
	99.2	Wt. % Recovery

VALUE:		
	3.962	$ Per Bbl. Chg.
	-146.115	$ Variation
	*SUB STD:	

Nalco	
Cat. Act.	
Date	
Cat. Loss Run No.	
Cat. Loss Mo. to Date	

LABORATORY INSPECTIONS

	Cat. Feed	No. 1 Cat. Gaso.	No. 2 Cat. Gaso.	Lt. Cycle	De-Cant	Poly Gaso.
Grav. °API						
ASTM Dist.						
I.b.p. °F.						
10 %						
50 %						
80 %						
90 %						
E. p. °F.						
R.v.p.						
Oct. No.						
3:0 cc.						
Flash °F.						
Pour Point						
C. Cont.						

CATALYTIC CRACKER

Type of Catalyst		
Coke Burned		Lb/Hr.
% Hydrogen in Coke		
Cat.-to-Oil Ratio		
W/Hr./W (Total Feed)		
Cat. Circ. Rate		Tons/MN
Reactor Temp.		°F
Regenerator Temp.		°F
Fresh Cat. Addition		Tons/D
Catalyst Loss		Tons/D
Slurry Return		B/D
Cat. in Slurry Return		Lb/Gal.
Total Spray Water		B/D
Steam to Spent Cat. Strip		Lb/Hr.
Disp. Steam to Reactor		Lb/Hr.
Steam Generated		Lb/Hr.
Total Blower Air		Lb/Hr.
Cat. Holdup in Reactor		Tons
Cat. Holdup in Regen.		Tons
Cat. Holdup in Strip.		Tons
Carb. on Spent Catalyst		Wt. %
Carb. on Regenerated Cat.		Wt. %
Regenerator Flue Gas CO_2		Mol. %
O_2		Mol. %
CO		Mol. %
Conversion on Fresh Feed		Vol. %
Cat. in Hopper		Tons
Cat. in Unit		Tons
TOTAL		Tons

TYPICAL CAT CRACKER BALANCE shows that operation did not meet preset standard. Fig. 5.

CHAMPLIN OIL & REFINING CO.
PRODUCED FUEL GAS AND COKE
SCHEDULE IE

Date_____ File: 86-500-101-100

	Total	Sep. Gas	Stab. Gas	Sec. Abs.	St. Run	C_3 and C_4
Cu. ft.	4,301.7	1,771.7	211.7	2,311.2	7.7	0.0
B.t.u.'s	3,172.2	736.8	371.3	2,048.7	15.4	0.0
B.t.u./cu. ft.	737.4	415.8	1,758.8	886.4	2,000.0	0.0
Lb.	173,211.8	17,948.0	16,657.3	144,897.4	716.1	0.0
C_3" Bbl.	44.2	0.0	0.6	82.1	0.0	0.0
C_3 Bbl.	107.5	17.7	72.2	15.4	2.2	0.0
C_4" Bbl.	1.6	0.0	0.0	1.6	0.0	0.0
IC_4 Bbl.	12.6	7.0	0.0	5.5	0.1	0.0
NC_4 Bbl.	2.7	2.7	0.0	0.0	0.0	0.0
C_5+ Bbl.	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL Bbl.	168.6	27.4	72.8	104.6	2.3	0.0
Coke, lb.	228,192.0					
B.t.u.'s	3,194.7					

Fig. 6.

3. The required blending octane units are then converted to vertical inches on a lead chart.

4. Horizontal inches from the left of the lead chart to intersection of the point which represents required blending octane unit

$$= \frac{\text{Required in.—clear in.}}{\text{3 cc. in.—clear in.}} \times \text{width chart.}$$

5. Next, another least-squares correlation is made to express the relationship between horizontal inches on a lead chart and cc.'s of lead.

6. From the last correlation it is possible to convert horizontal inches to reach blending octane unit required to cc.'s of lead per gallon.

From the indicated computations pertaining to the total gasoline pool, it is then possible to compute the octane value of each component. This is basically the form of the original refinery problem which was programed for our Alwac computer.

Outputs

The outputs from this problem list: (1) Unit cost for each finished product, (2) total margin covering the period under consideration, (3) volume of each finished product as well as individual component volumes, (4) gasoline pool lead level separated between premium and regular, and (5) individual gasoline - component lead levels. The machine time required for a complete economic study for a given set of conditions is approximately 15 minutes.

Reformer charge vs. cost . . . As an illustration of the type of information which is developed by this program, Fig. 3 shows a typical relationship between charge to the Platformer at a given severity level and cost per barrel of finished gasoline. Similar information is also available showing various severity levels of operation of the Platformer versus cost per barrel of finished gasoline. This same method may be applied to other operating units.

In the case of the Platforming unit, computer was programed to solve for the optimum point on the curve. Due to increased octane levels of gasoline, there is very little flexibility in varying the charge rate to the Platformer. Up to this point, the computed information was used to set operating conditions for the individual processing units based on a particular set of circumstances.

Linear Programing

In addition to the above mentioned uses of this program, another appli-

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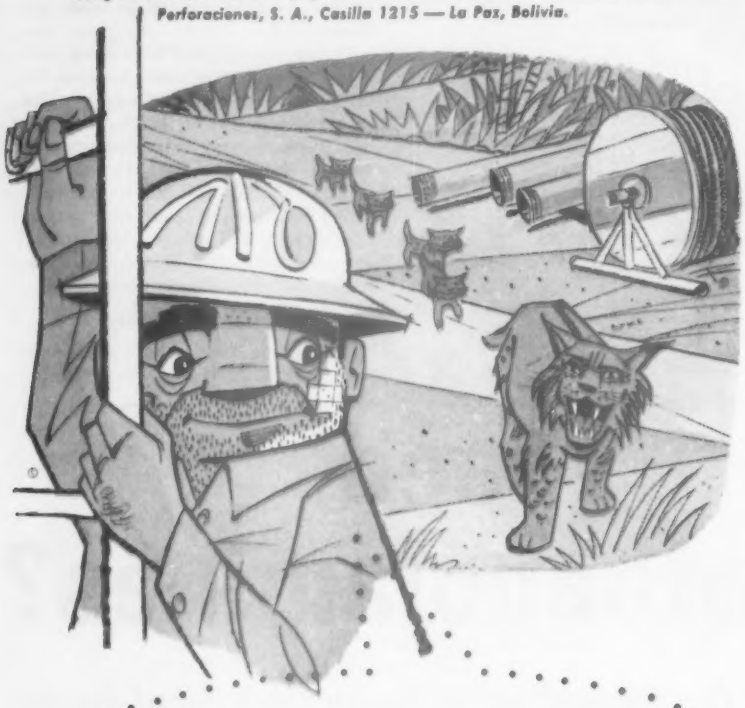

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cation was in computing lead values and octane units to be input into our linear-programing routine. We have used linear-programing techniques in gasoline blending and in a research evaluation of all gasoline streams. Time was saved by the refinery program in providing accurate and reliable answers for any set of operating conditions which might be chosen as a basis for a linear-programing problem. Information was gained in gasoline-blending techniques as well as pointing out problem areas which might be relieved by diverting a portion of a particular stream to a different possible use.

It was then realized that if maximum use was to be gained from this program, it would be necessary to reconcile the effect of daily changes with the accounting department's profit-and-loss statement. In order to do this, basic information would have to be readily available to be used as inputs for the program.

What information? . . . Fig. 4 illustrates the types of information which are needed in this program. The inventory and transfers data were not readily available by using conventional methods of solution. Mass-spectrometer analyses were being solved by desk-calculator methods and were, therefore, not current. Also, present methods did not allow enough time to process the desired number of samples. In order to speed up the inventory and transfer information, IBM cards were used and were processed on a 604 calculator to obtain basic information.

The detailed method for handling inventory and transfers is covered in the article following this. Solving of mass-spectrometer analyses was programed for the Alwac and results were made available on a current basis. Other inspection data were available to be used as needed. With the above information developed on a current basis, we were able to complete economic and material balances around individual units, which could be reconciled with the accounting department's profit-and-loss statement.

Cat cracker balance . . . For example, Fig. 5 depicts a typical balance around the cat cracker. This daily report indicates in this particular case that the 24-hour operation did not equal the preset standard. From the directly related figures on other reports, it is possible to determine the cause for substandard operations. These individual reports are combined to show an over-all economic and material balance. In searching through related reports to find the

reason for substandard operation of the cat cracker example mentioned above, Fig. 6, which is the produced gas and coke schedule, contains the answer.

The explanations of why the cat unit was short $146.12 can be determined from the following data. The gas-recovery unit was designed to recover 92% C_3's and normally operates at this level. therefore:

Total C_3's produced, bbl.	=560.3
92% of total C_3's, bbl.	=515.5
Calculated loss, bbl.	= 44.8
The actual loss, bbl. (from Fig. 6)	= 82.1
Loss above calculated loss, bbl.	= 37.3

The value assigned to C_3's is $0.02155 per pound.

37.3 bbl. × 181.76 lb. per bbl. = 6,780 lb.
6,780 lb. × $0.02155 per pound = $146.11, which is the amount that the cat unit was short as indicated in Fig. 5.

Larger Computer Needed

In reviewing our proposed system, we realized that more would be required of our computing system. Parts of the problem were being done on different equipment and many transcriptions and duplications were inherent. The new Univac computer was recognized as the system which fitted our needs.

BOOKS

OPTICAL MINERALOGY. By Paul F. Kerr. Published by McGraw-Hill Book Co., Inc., 330 W. Forty-second Street, New York 36. $8.50. 442 pp.

This book explains the use of the polarizing microscope in the study of transparent minerals. The optical properties of common minerals are given and the optical principles are explained. Tables are provided to aid identification. The book serves as a text for laboratory classes in optical mineralogy and provides a useful reference book wherever the polarizing microscope is employed.

New materials include: a chapter on the universal stage, improved techniques in the preparation of thin sections, extensive revision of the feldspars and other silicate groups, illustration of advances in microscopic instrumentation, and a considerable amount of new optical data.

CONSERVING NATURAL RESOURCES. By Shirley Walter Allen. Published by McGraw-Hill Book Co., Inc., 330 West Forty-second street, New York 36. 370 pp. $6.75.

This book covers the entire field of natural resources, including the minerals. It emphasizes the nature and occurrence of each group of resources, their significance in the individual and national economy and survival, the practices which led to their depletion and to their use, the maintenance and fair distribution which constitute their conservation.

The change in the viewpoint of the federal administration since 1953 is discussed; both advances and retreats in the conservation field are emphasized. The increased mechanization in handling several resources is noted.

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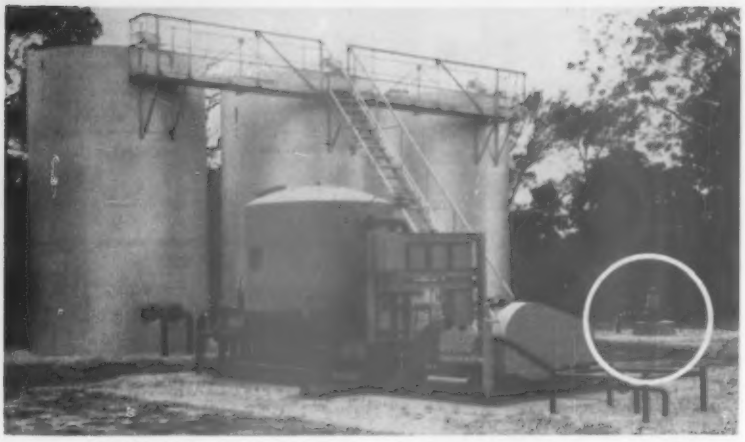
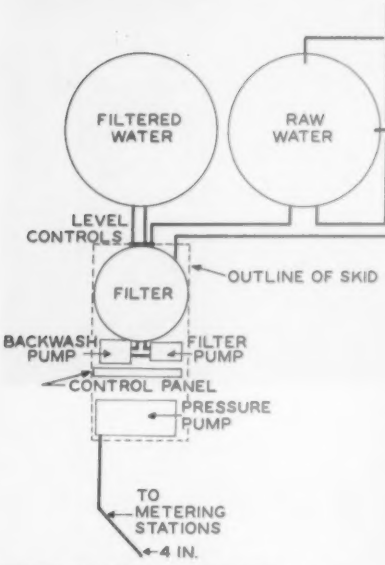


Skid-mounted flood unit

handles 4,000 bbl. of water per day at 1,000 psi., is automatic, and it is completely salvageable.

BY W. B. BLEAKLEY
Production Editor



WATER-HANDLING EQUIPMENT is seen in top photo, including the water-supply well in the background (circled). The piping is indicated schematically in the flowsheet, and photo at right shows some details of the skid and control equipment.

A NEW, compact, skid-mounted water-flood unit has been placed in service by Graybol Oil Corp., Tulsa, in East Francis field, Pontotoc County, Oklahoma.

Mounted on one skid is all of this equipment:

- Injection pump.
- Filter pump.
- Backwash pump.
- All wiring.
- All controls and starting equipment.
- Filter.

And the skid is only 22 ft. long and 8 ft. wide. The whole assembly weighs 13,500 lb. without filter charge.

Stock components . . . The filter and main skid were fabricated by Graver Tank & Manufacturing Co. All other equipment items were mounted on the main skid. The quintuplex injection pump is rated at 4,000 bbl. per day at 1,000 psi. It is driven by a 75-hp. electric motor. The filter and backwash pumps are centrifugal types, driven respectively by 3 and 7.5-hp. electric motors.

The suppliers prepared all of the equipment, and it was assembled into the compact unit by Graybol personnel, under the supervision of Frank E. Sims, engineer.

Other equipment . . . A water-supply well and three 400-bbl. storage tanks complete the water-flooding package. The tanks are of welded-steel construction, and one of them is equipped with a coned bottom to promote settling of the backwash water.

Automatic features . . . The unit is completely automatic except in the backwashing operation. The water levels in the raw-water and clear-water tanks are controlled by pressure switches mounted on the skid unit. Safety features are built in to prevent damage to any equipment in case of water-supply failure, line break, or power failure.

About the flood . . . Three sands in the field are receiving injection water; the Allen, Sonora, and the Thurman.

They are being simultaneously flooded through 11 injection wells on a modified five-spot pattern. Injection water is split on an acre-foot basis to the input wells. The 300-acre flood contains 6,586 acre-ft. of pay.

Water is metered at three stations. Two of these stations handle four wells each and the third has equipment for controlling three wells. Data available at the stations include wellhead pressure, lead-line pressure, and amount of injection water for each well.

Current injection rate is 1,700 bbl. per day, and this will soon be increased to 3,500 bbl. per day.

The main line to the metering stations is 4 in. and 3 in. The laterals to individual wells is 2 in.

Water system . . . Raw water from the supply well is pumped to the raw-water tank. The level in this tank is controlled by a pressure switch mounted on the skids. From there the water is pumped through the filter and into the clear-water tank where it can be picked up by the injection pump.

When the filter is backwashed, every 3 or 4 days, or as required, the backwash water is turned into the cone-bottomed backwash tank where it is allowed to settle.

Produced water from the field is taken from the separators and mixed with well water in the raw-water tank. No chemical treatment of the injection water is required so far, but operating personnel are running periodic tests to detect corrosion and formation plugging.

Electrified lease . . . Operating power for the entire lease is being purchased as 3-phase, 440-volt electricity. The equipment on the skid, and the water-supply well are all wired to use this power as is. Individual oil-well pumping units are driven by single-phase 230-volt motors. As production wells respond to the injected water, and as production increases, the pumping motors will be replaced with 3-phase, 440-volt equipment. The pumping units themselves are considered to be large enough to handle the expected production from most wells.

Small field crew . . . The automatic features of the lease permit complete operation by only two men, one operator and one pumper. They are responsible for the water-injection system, the 11 injection wells and 17 producing wells.

Graybol engineers predict a life of 6 to 8 years for the flood. At the end of this time, the entire unit can be easily moved to a new location because of the skid-mounted feature.

In the Illinois basin

FIG. 1

Carter licks a multizone injection problem

BY D. E. SHUPP
Carter Oil Co., St. Elmo, Ill.

MULTIPLE COMPLETION of water-injection wells permits segregated injection, controls water flooding in multiple-pay fields and minimizes development cost and operating life. Carter's experience with multizone water floods puts the stamp of approval on two and three-zone injection installation.

There are three methods by which segregated water injection may be achieved: (1) a separate well bore to each of the individual intervals; (2) flooding each zone alone through a common well bore, plugging off a zone as it becomes wateredout and opening another; and (3) the simultaneous but segregated flooding of each zone through a common well bore by multiple-completion of the injection wells. The choice of method to be used in any one water-flood project depends on the factors which must be considered in determining the optimum economic operation for the project. The first method usually offers the advantage of minimized operating life at the penalty of increased development cost. The second minimizes development cost, but prolongs operating life. The third minimizes both development cost and operating life.

Water flooding in the Illinois basin tristate area of Illinois, Indiana, and western Kentucky, has continued to increase in significance, with over 50% of the present oil production being realized from this recovery method. There are some 600 waterflood projects now in operation in this area, comprising about 150,000 acres and using 7,500 injection wells. The practice of completing water-injection wells with tubing and a packer to provide either segregated two-zone injection or single-zone injection with the casing annulus dry is common. The use of three-zone equipment, using multiple packers and tubing strings to enable segregated injection into three zones or into two zones with the annulus dry, is limited.

Presented at the spring meeting of the Eastern District API Division of Production meeting in Pittsburgh, under the original title, "Multiple-Horizon Water Flooding Techniques in the Illinois Basin."

PRODUCTIVE LIMITS of four Chester sand reservoirs, Loudon pool, Illinois. Fig. 2.

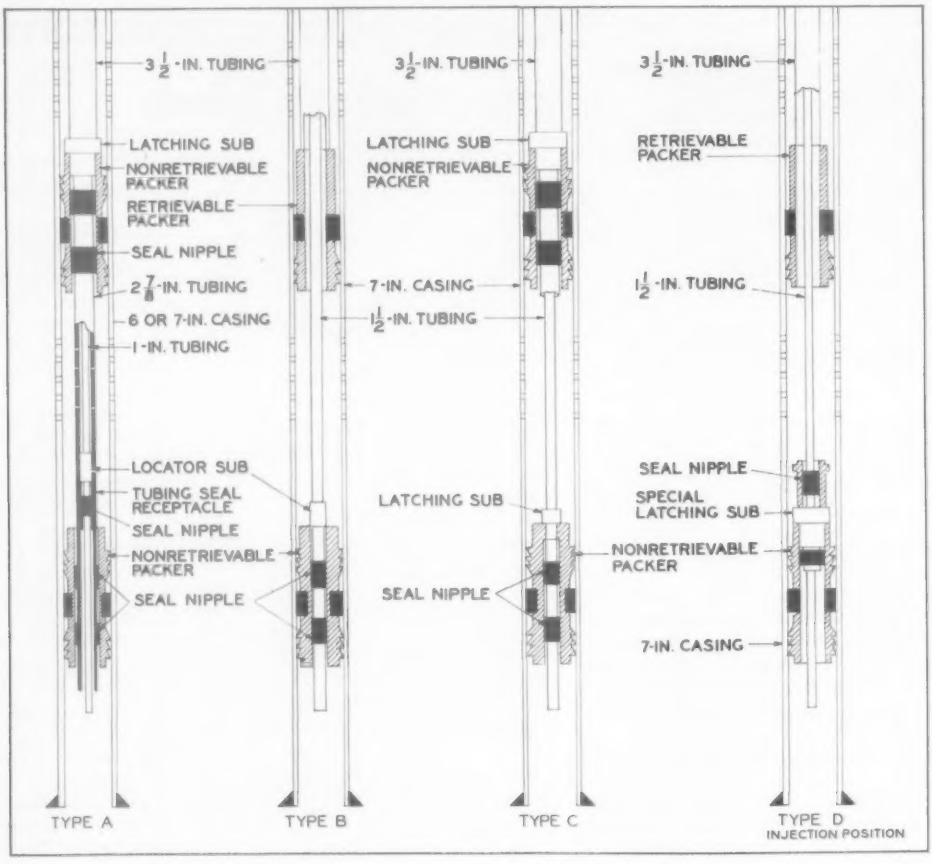
Carter operates 20 water flood projects in 15 fields in the basin, covering some 18,000 acres with 780 injection wells. Of this number of wells, 379 were completed for single-zone injection, 368 for segregated injection into two separate horizons, and 33 for three-zone injection.

Loudon Field Water Flood

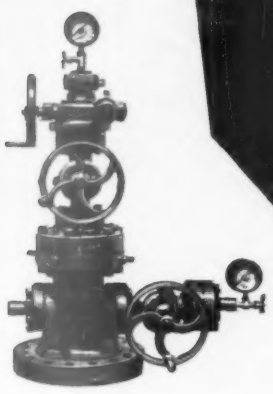
Loudon field is located in South Central Illinois on the northwest flank of the Illinois basin. Its location in relation to other fields in the basin with major water-flood projects is shown in Fig. 1. The producing horizons under flood are four Mississippian Chester sand reservoirs, the Weiler, Paint Creek, Bethel, and Aux Vases, ranging in depth from 1,400 to 1,600 ft. These four reservoirs overlap one another, as shown in Fig. 2. The four Chester sands average approximately 20% porosity and 100 md. permeability, with connate water of 28%. The produced oil is 38° API gravity, with a viscosity at current reservoir conditions of less than 5 cp.

Primary completion practice for most wells involved opening all productive Chester zones into the common well bore with no attempt to segregate production from the individual zones. Some twin wells were drilled in the southern portion of the field, but the usual practice was multiple-horizon completion. Casing was set on the top of the lower sand and the upper sands were opened through windows. The northern portion of the pool, developed on 20-acre spacing, is being flooded on the sunflower pattern with former gas input wells now used for water injection. The south portion of the pool, developed on 10-acre spacing, is being flooded on the 5-spot pattern. With minor exceptions, the 20-acre, 5-spot pattern is used, accomplished by converting alternate producing wells to water injection.

Injection-well completions . . . Carter operations in the field currently include 13,900 acres being flooded from 568 injection wells. Of this number, 313 are dually completed and 22 are triple completions. Of the triple completions, 18 provide three-zone segregated injection and four enable two-zone segregated injection with the third zone isolating a casing leak. Conversions from former producing or gas input wells account for 435 of the water-injection wells, with the remainder being newly drilled holes.



THREE-ZONE waterflood injection equipment, four types. Fig. 3.



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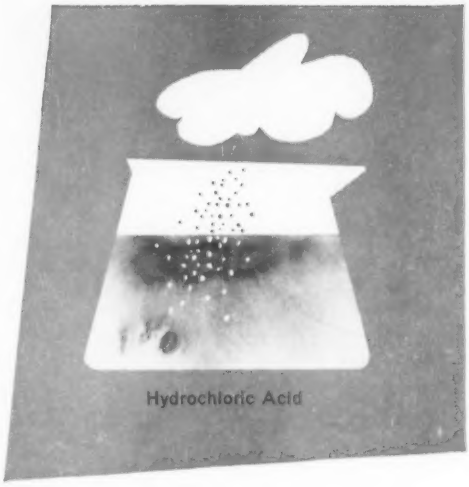

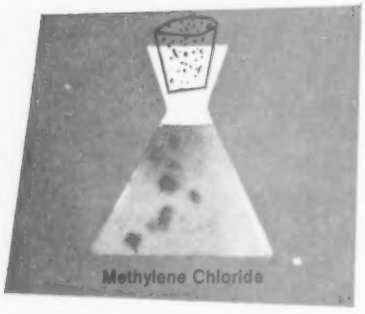

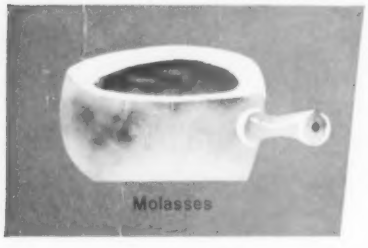

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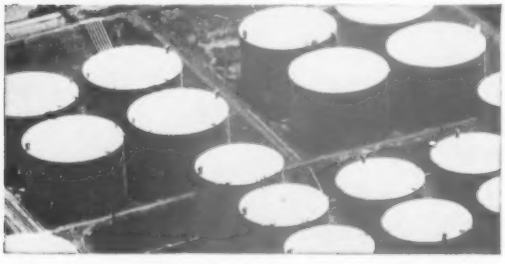

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Conversion procedure involved cleaning out the hole and nitroglycerin shooting or hydraulic fracturing where sand was not completely exposed during initial development. Single-zone injection is generally through tubing set in a full-bore retrievable tension packer in converted wells and down the casing in newly drilled inputs. Two-zone injection is accomplished by use of tubing and a packer to segregate the zones, with injection through tubing into the lower zone and through the casing annulus for the upper horizon. A retrievable fullbore hook-wall packer is used where the upper zone is open through perforations and a nonretrievable fullbore packer is always used below windows. The first three-zone installation was made in January 1954. Fig. 3 illustrates the various arrangements of subsurface equipment which have been used. Type A installation consists of two nonretrievable production packers set between the top and middle zones and middle and bottom zones. A section of 2⅞-in. o.d. perforated tubing is assembled with a latching sub, a 1-in. tubing-seal receptacle, and tubing-seal nipples spaced to correspond with the packer settings. This assembly is run in the hole on 3½-in. o.d. tubing and the latching sub engaged in the top packer latching attachment. A length of 1-in. o.d. tubing slightly longer than the 2⅞-in. tubing and assembled with a locator sub and tubing-seal nipples is run on 1½-in. tubing inside the 3½-in. o.d. tubing string, the seal nipples and the locator sub seating in the tubing-seal receptacle.

Type B installation also uses a nonretrievable packer between the middle and lower zones, differing only in that the packer inside diameter is reduced to accommodate a 1½-in. tubing-seal nipple and locator sub. A retrievable hook wall packer is then run on 3½-in. tubing and set between the middle and top zones and a 1½-in. tubing-seal nipple and locator sub assembly is then run on 1½-in. tubing inside the 3½-in. tubing and seated in the lower packer.

Type C installations, which were all made in a project located in another field, are similar to the type A installations except that the 2⅞-in. perforated tubing is omitted and the 1½-in. tubing latches directly into the bottom packer with an anchor tubing-seal assembly. The latest three-zone sub-surface installations, type D, are similar to the type B installations except that a modified cement retainer is used as the bottom packer with a special latching sub bored to accommodate a seal nipple which is run on the 1½-in. tubing. Removal of this latching sub by means of a special retrievable sub after both tubing strings and the upper retrievable packer have been pulled provides a full-bore opening through the lower packer for access to the lower zone.

Before installation, the packer seat locations are tested with a retrievable packer and after installation the assembly is tested for communication by injecting into the various zones and checking pressures and fluid levels in the other zones. Segregated injection is attained in all cases to the bottom zone through the 1½-in. tubing, to the middle zone through 3½-in. tubing, and to the top zone through the casing annulus.

There are inherent advantages and disadvantages to each type installation. when latching-sub assemblies are used, the effect of pressure differential across the packer is eliminated and more positive holddown is provided to the tubing. However, if removal of the equipment is necessary, failure of latching assemblies to release could result in losing nondrillable material in the hole. The use of an upper retrievable packer reduces this possibility, but has a disadvantage of having a less positive holddown since the packer is seated and held in place by the weight of the 3½-in. tubing. Except for the type C installation, the 1½-in. tubing string is held in place by surface holddown attachments. The use of large-bore lower packers in the types A and D installations will permit greater accessibility to the lower zone in case of needed remedial work. From a cost standpoint, the installations using the two non-retrievable packers are the most expensive. Type D is the least expensive and the cost, exclusive of tubing, is less than $1,000.

Injection-well performance . . . Except in a limited number of wells, segregated injection has been maintained and only rarely has it been necessary to drill out packers to perform remedial work. Accumulated water injections into the three-zone inputs have ranged to about 874,000, 366,000, and 410,000 bbl., respectively, through the casing annulus, the 3½-in. tubing, and 1½-in. tubing. Corresponding injectivities are as high as 330, 195, and 200 bbl. per day.

Communication between zones has been indicated in two wells with three-zone equipment installations; however, the leaks are believed behind the casing and no remedial work has been performed in the wells. In one Loudon well in which three-zone equipment was originally used to isolate a casing leak, the equipment was removed to cement a liner in the well after which conventional two-zone equipment was run.

Some difficulties have been experienced due to water quality problems in two other flood projects, and the three-zone wells in these fields have been, at least temporarily, converted to two-zone segregated inputs by pulling the inner tubing strings and commingling injection into the two lower zones. No serious problems were encountered in the remedial work, which included running through the lower packers to bottom and circulating to clean out the well.

NEXT WEEK . . .

Special Report on Pipeline Costs

WHAT IT COSTS to build and operate pipelines will be spotlighted in a special 16-page Journal report July 13. Watch for these significant articles:

- Cost Trends in Gas Lines
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DRILLING

New tool holds cement for big fracture repair

BY B. E. YESTER
Ohio Oil Co.
Grass Creek, Wyo.

ONE of the most difficult problems in drilling is lost circulation.

In most Rocky Mountain areas, there is some lost-circulation trouble in any well. However, normal mudding procedures usually regain returns. In some areas lost-circulation materials completely fail and it becomes necessary to revert to cementing.

The most serious type of lost circulation seems to occur in large fractures, crevices, or caverns into which very large volumes of cement or other lost-circulation controls may be pumped without success.

It was for these particular conditions that the Sure Check Tool was designed.

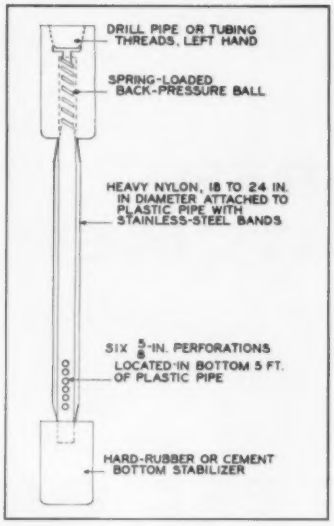
The originators of the new tool believed that the answer to the problem was retaining cement at the lost-circulation zone until set. Also, the retainer should be of some material which could readily conform to hole irregularities but still have sufficient strength to hold the cement in place. The original design is shown in the accompanying illustration.

The material selected was a heavy-grade nylon, 18 to 24 in. in diameter, ter, formed into a bag. This nylon bag was attached to a perforated plastic nipple of any predetermined length by stainless-steel bands. Cement pumped into the nylon would expand the bag to hole size and retain the cement.

On each end of the plastic pipe were placed stabilizers of either cement or hard rubber, the lower one bull-plugged and the upper one threaded for either drill pipe or tubing. To prevent destruction of the nylon bag while running in the hole, rubber bands are spaced every foot over the length of bag. A spring-loaded back-pressure ball located in the top stabilizer acts as a float while running in the hole and also assures no flowback after the cement is in place.

If desired, a cementing ball or top rubber plug may precede the displacement fluid. The drill pipe or tubing is then released from the top stabilizer by right-hand rotation and pulled. After sufficient waiting-on-cement time, a bit will readily drill all parts of the tool.

Presented at 1959 spring meeting, API Division of Production's Rocky Mountain District, Casper, under the original title: "A New Approach to Selective Open-Hole Cementing."


DRILL PIPE OR TUBING THREADS, LEFT HAND
SPRING-LOADED BACK-PRESSURE BALL
HEAVY NYLON, 18 TO 24 IN. IN DIAMETER ATTACHED TO PLASTIC PIPE WITH STAINLESS-STEEL BANDS
SIX 5/8-IN. PERFORATIONS LOCATED IN BOTTOM 5 FT. OF PLASTIC PIPE
HARD-RUBBER OR CEMENT BOTTOM STABILIZER

THIS TOOL keeps cement from running off into large fractures.

In the Madison . . . The tool has been applied in many parts of the Rocky Mountain area with varying degrees of success. The Madison Limestone is undoubtedly one of the most severe lost-circulation zones in the Big Horn basin of Wyoming. It is in this formation in the Grass Creek field that two attempts were made to evaluate the tool.

It was first used in pre-Tensleep Unit Well No. 1, a proposed Granite test. Circulation was lost at 4,937 ft. in the base of the Madison Limestone. After attempting for 9 days to regain circulation, the hole was dry drilled to 4,987 ft. It was decided not to attempt further drilling but to run casing and complete the well.

A Sure Check Tool was chosen to serve as a plug above the lost-circulation zone so that logs could be run and the production casing properly cemented. A 17 ft. tool was run on 4½ in. drill pipe and landed from 4,926 ft. to 4,943 ft. opposite the lost-circulation zone. The bag was filled with 35 sacks of regular cement, 2% $CaCl_2$, with 15 lb. of Gelflake.

The top of the cement plug was found at 4,860 ft, 66 ft. above the top setting point of the tool. Good cement was drilled to 4,920 ft. with full returns. The hole was logged, production casing landed at 4,919 ft, and successfully cemented.

The second application of the new tool in the Grass Creek Field was in pre-Tensleep Unit Well 2, also in the Madison Limestone. The tool was landed from 4,639 ft. to 4,685 ft. and 150 sacks of cement pumped into the nylon bag.

Circulation was lost while drilling out the tool at 4,653 ft. The job was classified as a failure and no other attempts were made in this well.

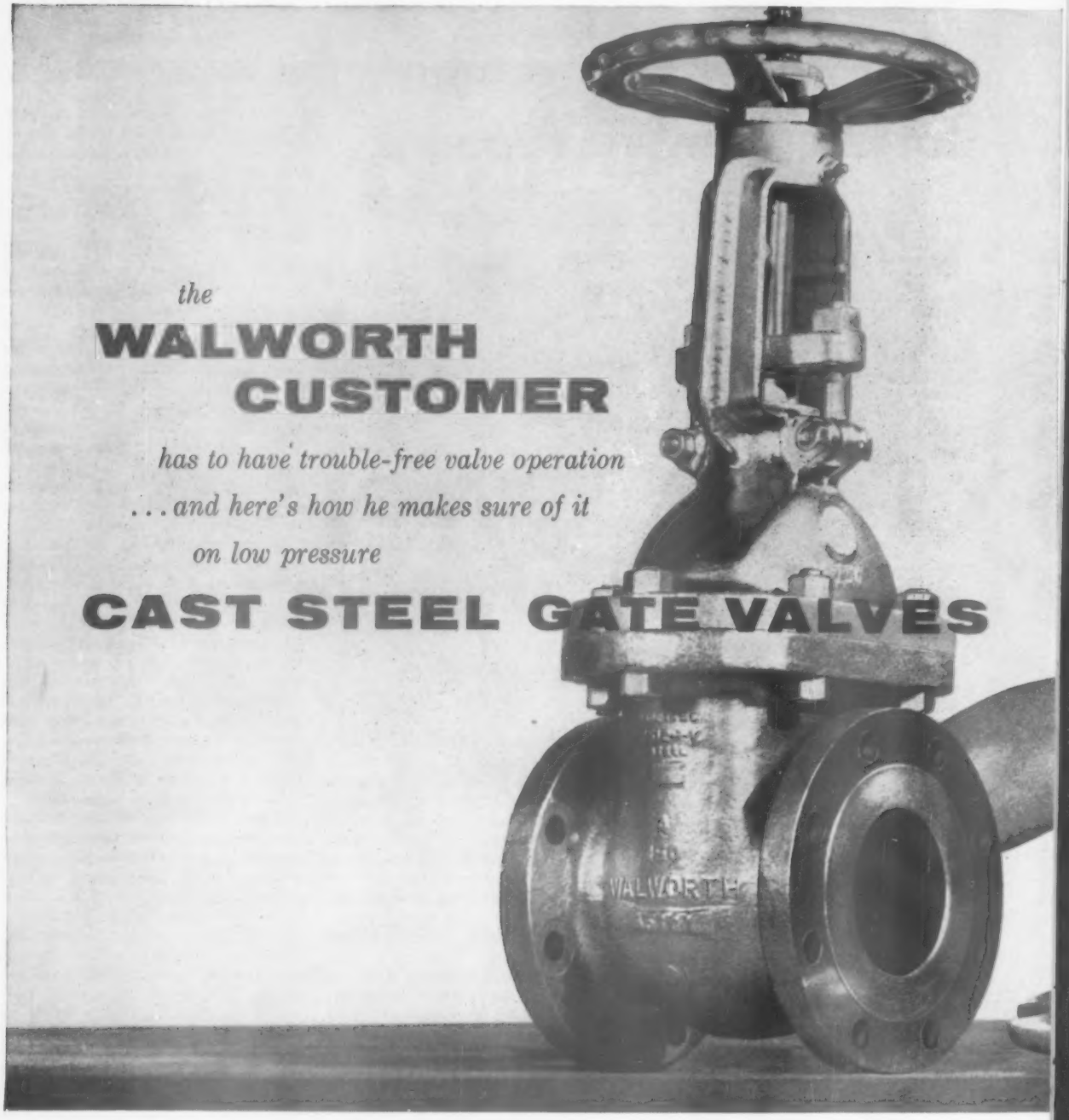
Success in other areas . . . Other operators have had definite success in the Rocky Mountain area in southern Utah, the Lusk area of the Powder River basin, core-drilling operations in Nevada, and in the La Barge area of Green River basin. While drilling near La Barge, the bit dropped through a 38-ft. cavern. Circulation was regained after running three tools.

The tool has also been successful in producing wells, particularly open-hole completions. The Frontier formation of the Grass Creek field was discovered in 1916 and all wells were cased on top of the producing sands and then shot with nitroglycerin. In May 1957, gas repressuring was started and because of the differences in sand thickness, permeability, and porosity, the gas front was not the same in all sands. To control gas-oil ratios, it has been necessary in some wells to plug back to higher sands.

Under conditions of little bottom-hole pressure and excessive gas production, several plugbacks failed when attempted with conventional cement plugs through tubing or with a dump bailer. The cement would become extremely gas cut and not set properly. A tool of approximately 6 ft. in length to be run on tubing was designed for use in these wells. The usual procedure in these shallow wells is to dump three sacks of cement into the nylon bag through the tubing and allow the cement to reach its initial set before pulling the tubing. To date we have had six successful jobs out of eight attempts.

The following features make the tool a promising one for selective open-hole cementing:

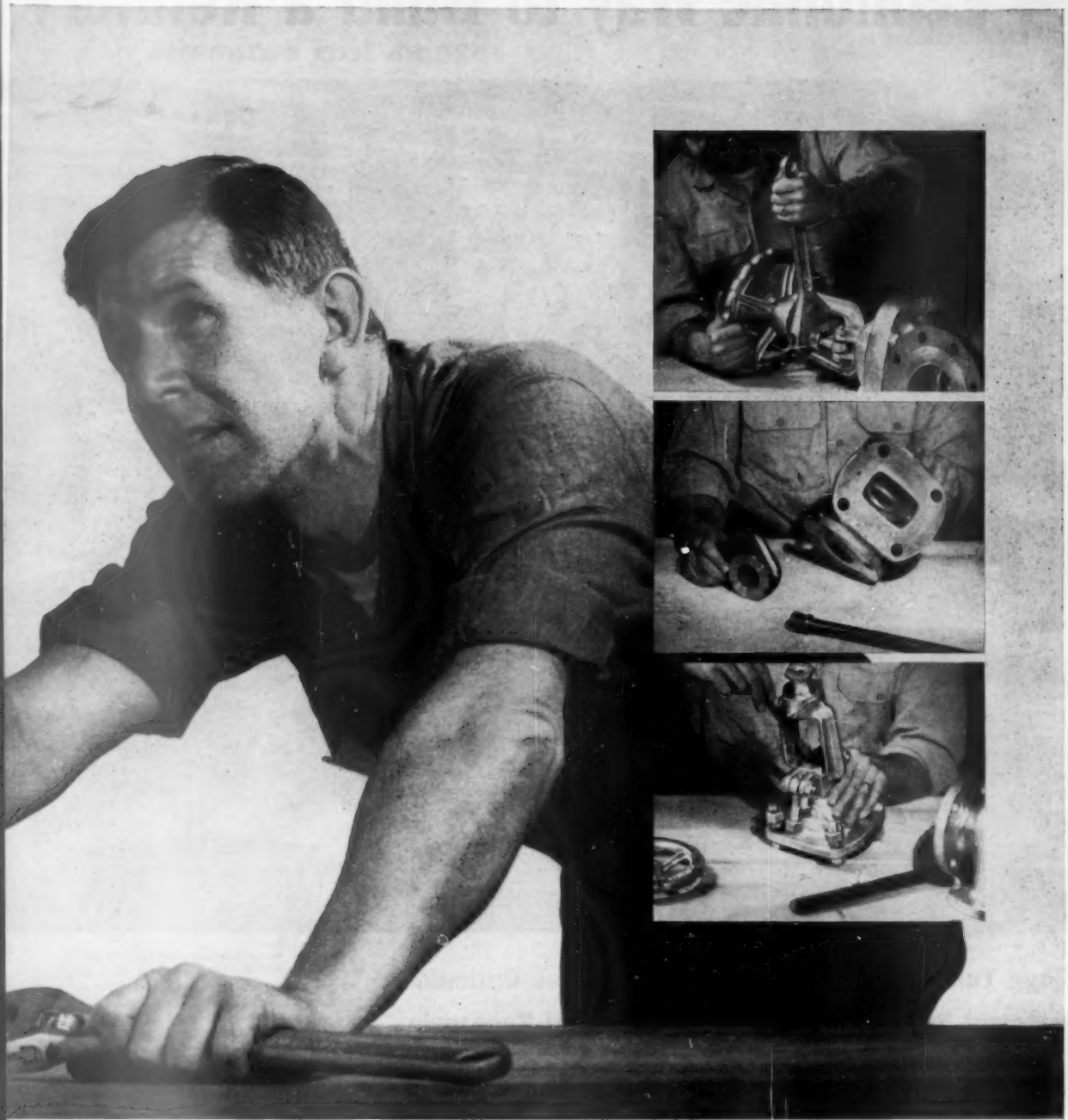
1. Can be of any predetermined length.
2. Can be landed at any depth for selective placement of cement.
3. Cement volumes are greatly reduced.
4. Variations in hole size do not affect the success of the tool.
5. All parts of the tool are easily drilled.



Before the Walworth Customer makes his decision on cast steel valves he gets persistently curious about things like these: What features reduce turbulence and pressure drop? Can body-to-bonnet joint be reassembled in the field without danger of misalignment? Is stuffing box deep enough to assure tightness and maximum life of packing?

In the Walworth Cast Steel Gate Valves he finds streamlined ports to fight turbulence and pressure drop. He finds flat gasket and male-and-female joint closures that assure correct realignment in field or shop reassemblies. He finds stuffing box depth adequate-plus for tightness and packing durability.

It's for customers like this man that



Walworth exists. We know he's hard to please, and we're proud to please him. If his exacting buying standards in valves are yours, too, we'd like you for a Walworth Customer. For details on all types and ratings of Walworth Cast Steel Gate Valves, or any of the complete line of Walworth Valves, contact your Walworth Distributor.

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Economic Way to Build a Refinery

Kellogg Turn-Key Plant for El Palito Assures Optimum Investment Return for Mobil Oil Company of Venezuela

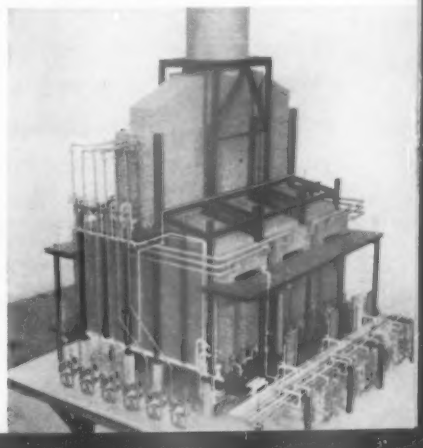
Many engineers are familiar with the phrase, "a turn-key plant", used when complete responsibility for a new refinery is given to a single engineering and construction firm. In such cases, the one firm handles all aspects of engineering, scheduling, purchase and transportation of materials, and erection.

In effect, the contractor hands over the key to the refiner, delivering a completed and fully operable plant.

The many advantages of a turn-key plant were apparent to Mobil Oil Company of Venezuela when planning its new 50,000 BPD refinery at El Palito. Complete responsibility for the project was awarded to Kellogg. The products of the refinery, which is designed to operate on Barinas crude, will include Mobilgas, Mobilgas Special, kerosine, jet fuel, middle distillate, and heavy fuels.

If you are planning to expand refining facilities in any part of the world, the Kellogg organization welcomes the opportunity to prove the economies of working with its engineers on the most suitable process units or combination of units.

One of the many techniques being employed by Kellogg to achieve the optimum plant for Mobil is its system of designing directly on models. Above: designers are shown working simultaneously on sections of the El Palito refinery. Models such as these reduce engineering time, improve designs, minimize drawings, facilitate approvals, and contribute to an earlier on-stream date. Below: Kellogg's model of the crude oil furnace in close-up, showing the fine detail of technique.



THE M. W. KELLOGG COMPANY, 711 THIRD AVENUE, NEW YORK 17

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BY W. L. NELSON, Technical Editor and Petroleum Consultant

COSTimating

Itemized cost indexes

THE COST INDEXES may be used to convert prices at any date to prices at other dates by ratios of the cost indexes of the same date. Itemized indexes are published each quarter (first weekly issues of January, April, July, and October). In addition, the Nelson Construction Cost Index is published in the first issue each month of The Oil and Gas Journal.

	1950	1954	1956	1957	1958	Feb. 1959	References*	Index for earlier years (The Oil and Gas Journal) in Costimating and Questions on Technology issues
Operating costs (based on 1956 as 100.0):								
Power, electric, industrial	97.3	¶98.5	100.0	¶101.3	103.7	103.8	Code 540-03	
Fuel, residual	70.3	86.5	100.0	112.4	102.6	105.7		No. 4—Mar. 17, 1958
Gulf cargoes	78.0	85.9	100.0	123.8	102.9	93.5		No. 4—Mar. 17, 1958
N. Y. barges	76.9	82.6	100.0	112.3	93.0	85.9		No. 4—Mar. 17, 1958
S. Pedro bunkers	65.8	84.3	100.0	129.2	114.6	99.5		No. 4—Mar. 17, 1958
Oklahoma	77.7	62.0	100.0	105.3	66.3	94.8		No. 4—Mar. 17, 1958
Fuel, natural gas, wellhead	60.2	88.9	100.0	101.8	119.4	129.0	Code 531-01	
Industrial chemicals	83.3	96.9	100.0	101.9	101.8	101.9	Code 61	
Phosphoric acid	86.7	96.6	100.0	100.9	103.4	103.4	Code 611-07	
Sulfuric acid	80.8	100.0	100.0	100.0	100.0	100.0	Code 611-09	
Ammonia	104.8	103.0	100.0	98.3	103.8	106.5	Code 611-13	
Lime	64.6	92.0	100.0	106.4	104.4	104.8	Code 611-29	
Sodium carbonate	75.5	92.9	100.0	104.3	104.3	104.3	Code 611-65	
Sodium hydroxide	76.3	90.9	100.0	103.6	112.6	115.7	Code 611-69	
Sodium phosphate	87.5	95.5	100.0	101.1	104.6	104.6	Code 611-71	
Furfural	79.0	100.0	100.0	100.0	100.0	100.0	Code 612-63	
MEK, drums	80.0	94.5	100.0	105.2	106.9	103.3	Ch. & E. News	
Phenol	81.3	90.4	100.0	103.2	102.7	100.0	Code 612-83	
TEL	94.1	102.8	100.0	101.5	99.9	101.4	Supplier	
Operating labor (wages)	72.0	88.7	100.0	103.9	105.4	109.7	Employ. & Earn.	No. 55—Nov. 3, 1949
Productivity	85.5	97.1	100.0	98.0	100.3	113.0	Employ. & Earn.	Sept. 24, 1956§
Construction wages (1946 = 100):								
Skilled construction	140.0	174.6	187.3	196.3	205.1	210.7	Eng. News Record	No. 55—Nov. 3, 1949
Common labor	148.1	192.1	209.2	221.0	235.7	242.4	Eng. News Record	No. 55—Nov. 3, 1949
Refinery construction	144.0	183.3	198.2	208.6	220.4	226.6		No. 61—Dec. 15, 1949
Equipment or materials (1946 = 100):								
Arc-welding machinery	....	158.4	180.2	186.6	193.2	193.7	Code ‡1176	May 2, 1955§
Boilers, tanks, and sheet metal	†136.0	147.3	168.0	176.3	175.1	175.9	Code 1072	Apr. 21, 1952§
Building materials (nonmetallic)	127.0	143.6	154.0	159.9	161.7	163.4	Code ‡13	No. 22—Mar. 17, 1949
Brick-building	132.5	144.7	159.2	161.3	162.4	165.2	Code 1341	No. 20—Mar. 3, 1949
Brick—fireclay	153.4	193.1	218.1	232.7	238.7	244.4	Code 1342	May 30, 1955§
Castings (foundry products)	152.9	181.1	204.7	220.5	227.2	229.2	Code 1015	No. 46—Sept. 1, 1949
Clay products (structural, etc.)	134.6	159.1	176.9	184.0	187.0	190.7	Code 134	No. 20—Mar. 3, 1949
Concrete—ingredients	125.3	142.1	153.3	159.7	163.2	164.6	Code 132	No. 22—Mar. 17, 1949
Concrete—products	124.4	138.5	144.9	149.0	151.0	152.0	Code 133	
Electrical machinery	134.9	159.9	175.0	¶188.6	192.7	193.3	Code ‡117	May 2, 1955§
Motors and generators	135.0	157.7	169.6	181.2	186.4	187.2	Code ‡1173	No. 31—May 19, 1949
Switchgear	....	171.2	194.9	¶212.0	218.8	217.9	Code ‡1175	May 2, 1955§
Transformers	131.6	161.9	175.4	188.0	187.3	188.1	Code ‡1174	No. 31—May 19, 1949
Engines (composite)	126.0	150.5	164.0	173.9	178.3	178.8	Code ‡1154	No. 36—June 23, 1949
Exchangers	140.0	¶171.7	¶190.7	203.6	181.2	176.4	Manufacturer	No. 2—Oct. 28, 1948
Copper base	....	¶190.7	198.8	191.4	168.8	168.0	Manufacturer	
Steel	....	¶156.8	178.6	213.2	190.0	183.0	Manufacturer	
Fans and blowers	162.9	192.6	222.4	236.1	241.7	245.9	Code 1147	Feb. 17, 1948§
Hand tools	143.2	173.8	200.3	214.3	224.7	229.3	Code 1042	June 27, 1955§
Instruments (composite)	127.8	154.6	182.1	187.4	194.9	204.1	Manufacturer	No. 34—June 9, 1949
Flowmeter (mechanical)	114.0	161.6	203.3	203.3	209.9	219.1	Manufacturer	No. 34—June 9, 1949
Flowmeter (air control)	138.5	179.6	203.9	208.2	216.3	223.5	Manufacturer	No. 34—June 9, 1949
Flowmeter (remote)	135.5	146.5	170.2	171.2	176.4	179.2	Manufacturer	No. 34—June 9, 1949
Potentiometer, 6-point	134.0	167.2	211.8	230.9	240.4	265.0	Manufacturer	No. 34—June 9, 1949
Potentiometer, air control	134.1	150.5	192.3	204.6	212.6	231.6	Manufacturer	No. 34—June 9, 1949
Pressure controller recorder	135.6	166.3	187.1	189.3	200.0	200.0	Manufacturer	No. 34—June 9, 1949
Pressure gage	101.2	108.6	119.2	119.2	119.2	119.2	Manufacturer	No. 34—June 9, 1949
Thermometer (recording)	124.0	152.8	170.2	171.8	179.7	179.7	Manufacturer	No. 34—June 9, 1949
Control valve	133.3	162.0	180.9	187.8	199.3	199.3	Manufacturer	No. 34—June 9, 1949
Lumber (composite)	193.0	197.8	214.5	201.8	198.9	206.9	Code 81	No. 7—Dec. 2, 1948
Southern pine	176.9	181.2	195.0	187.6	184.7	186.4	Code 812	No. 7—Dec. 2, 1948
Other soft woods	230.2	252.7	266.5	257.6	251.2	257.2	Code 813	No. 7—Dec. 2, 1948
Machinery:								
General purposes	136.7	159.9	183.8	196.5	199.6	204.4	Code 114	Feb. 17, 1949§
Construction	140.1	165.9	187.4	199.4	209.6	216.0	Code 112	
Oil field	†135.8	†161.9	†179.3	103.2	192.5	192.4	Code 1151	Oct. 10, 1955§
Paints—prepared	140.0	159.0	169.2	178.1	180.9	181.0	Code 621	May 16, 1955§
Pipe:								
Sewer	120.7	140.1	160.5	168.0	170.1	174.9	Code 1345	No. 22—Mar. 17, 1949
Black iron	160.0	195.0	233.0	256.1	264.8	263.8	Code 1014-56	No. 19—Oct. 15, 1956
Six-inch line	†159.0	200.5	241.2	268.3	276.9	275.9	Code 1014-58	May 4, 1957§
Pumps, air compressors, etc.	138.2	166.5	192.0	206.7	214.7	226.3	Code ‡1141	No. 29—May 5, 1949
Steel (iron and steel)	152.9	179.6	209.0	224.5	228.2	233.0	Code 101	No. 61—Dec. 15, 1949
Steel—finished steel	153.7	187.1	212.4	232.5	240.6	245.0	Code 1014	July 25, 1955§
Plate	....	187.0	215.9	241.8	252.7	257.4	Code 1014-26	Mar. 4, 1957§
Structural shapes	162.7	193.4	219.1	252.2	262.8	268.5	Code ‡1014-31	No. 18—Feb. 17, 1949
Seamless tubes, 2-2¾ in.	149.5	199.4	235.5	265.4	277.5	285.1	Code 1014-61	Sept. 5, 1955§
Valves and fittings	†135.8	197.1	231.9	243.4	242.7	253.5	Code ‡1149 (10 items)	No. 46—Sept. 1, 1949
Nelson Refinery Construction (1946)	146.2	179.8	195.3	205.9	213.9	219.1		No. 61—Dec. 15, 1949
Nelson Ref. Operation (1956)	72.4	88.7	100.0	107.0	105.9	103.7		No. 2—Mar. 3, 1958
Nelson Ref. Process Oper. (1956)	75.1	88.4	100.0	108.1	105.8	103.4		No. 2—Mar. 3, 1958

*Code refers to the revised index code number of the Bureau of Labor Statistics, U. S. Department of Labor, "Wholesale Prices."

†Estimated base value for 1946.

‡Not exactly the same items as those published before July 7, 1952.

§Questions on Technology, The Oil and Gas Journal. ¶Revised.

engine power BY CATERPILLAR

When you build or this is what it means

These Continental-Emsco Drilling Tenders with 18 engines demonstrate the advantages of Cat power

Building *or* buying in-stock oilfield equipment, you get important advantages when the equipment has Cat Engine power throughout. Take these Drilling Tenders, built by Continental-Emsco Company, Dallas, Texas, for in-stock delivery. A total of 18 Cat Engines—from the compact D311 to the mighty D397—power them.

Cat Diesels have complete market acceptance. This is important to equipment builders—because the eventual buyer is the person who has created Caterpillar Engine acceptance. With Cat Engines and Electric Sets, there's no doubt about power dependability. Caterpillar and dependability are synonymous in oilfields throughout the free world. Cat Engines are built for heavy duty from the ground up. They aren't industrial versions of automotive-type diesels.

Parts and service availability is another Caterpillar advantage. Wherever Cat-powered, in-stock equipment goes in the free world, one of 840 Caterpillar Dealers is nearby with a complete parts and service organization.

When you build oilfield equipment—power with Cat Engines for easy selling. When you buy in-stock equipment and there's a choice of power—remember that Cat is *matched* to heavy-duty oilfield equipment.

Your Caterpillar Engine Specialist will give you answers to any oilfield equipment power question.

CATERPILLAR

Engine Division, Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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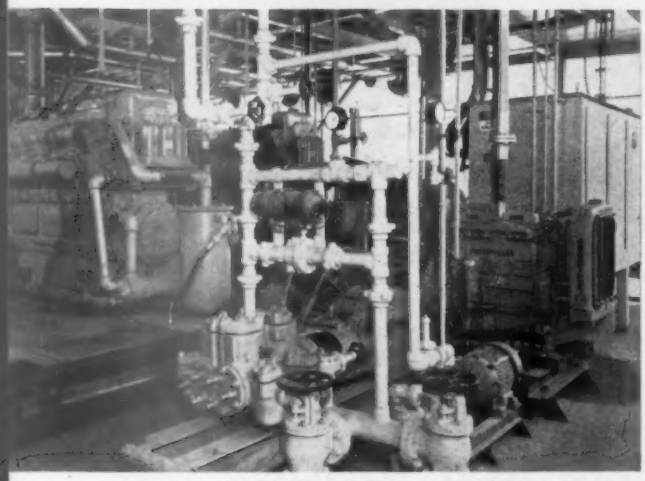
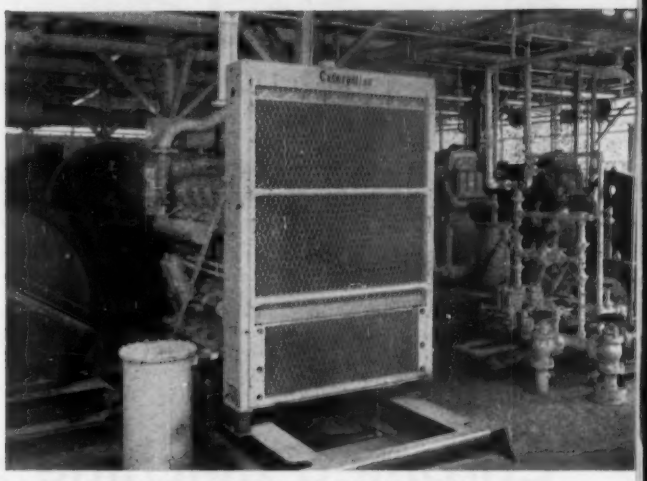
CONTINENTAL-EMSCO COMPANY, Dallas, uses 18 Cat Engines for auxiliary and prime power on the two Lake Maracaibo Drilling Tenders shown here. The tenders are 180′ long with 70′ beam and 11′ 3″ draft. Each is equipped with a helicopter deck, 45′ x 83′.

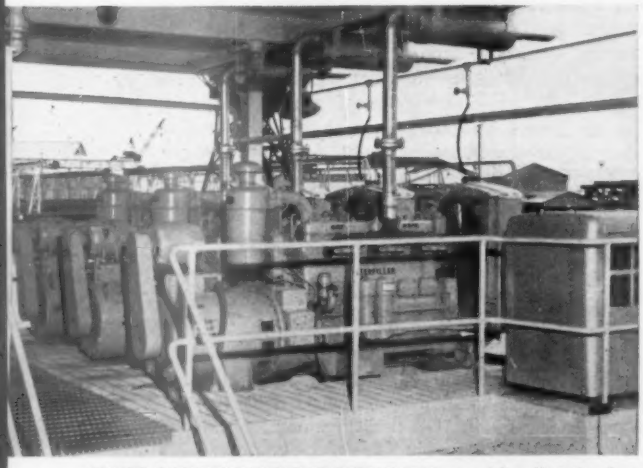
buy "in-stock" oilfield equipment to have top quality throughout



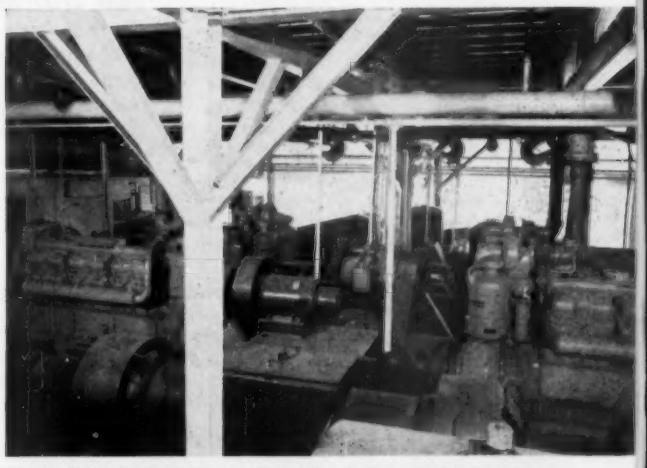
A MODERN, HEAVY-DUTY CAT D311 ENGINE (right) drives a Gardner-Denver FG-FXG 5" x 6" pump on each tender. These Cat-powered duplex pumps supply raw water for washing down rigs and keeping tenders clean. The D311 is rated at 65 HP. Other Caterpillar Engines range up to 650 HP (maximum output capacity).



HERE A CATERPILLAR DIESEL D375 ENGINE supplies power for a Gardner-Denver mud pump on each tender. Continental-Emsco Company finds the D375 an excellent power-match for the 7¼" x 14" Model FK-FXK pump. Every Caterpillar Engine and Electric Set is built to meet heavy-duty demands.



THREE CAT D318 DIESEL ELECTRIC SETS provide all A.C. electric power for each tender. Uses include excitation for the D.C. rig drive equipment, the generator and motor blowers, mud mixers, water and fuel pumps, and lighting for rig and living quarters.

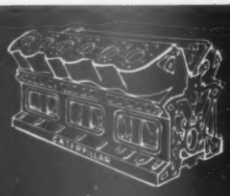


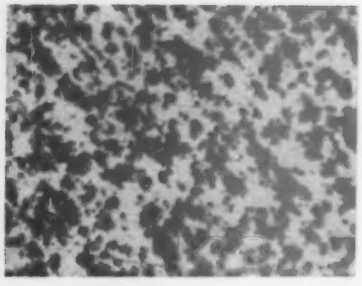
FOUR TURBOCHARGED CAT D397 DIESEL ENGINES drive Continental-Emsco "Del Lago" type compounding transmissions on each tender. The rigs, intended for service on Lake Maracaibo, Venezuela, have a drilling depth of 12,000 to 15,000'.

Caterpillar's own foundry casts engine blocks of a special high-tensile strength alloy, 50% stronger than ordinary gray iron castings. Numerous ribs and partitions provide further strength.

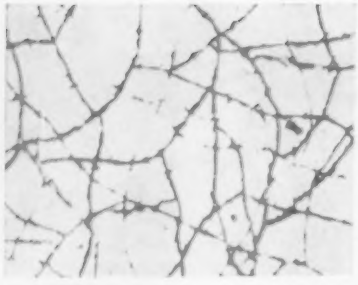
LOW FUEL COST. Caterpillar Engines don't require expensive diesel fuels, work fine without clogging even with No. 2 furnace oil. They burn fuel more completely, to save you money.

Honest horsepower. Your engine comes with a notarized certificate of power backed by Caterpillar Tractor Co. You get what you're promised.

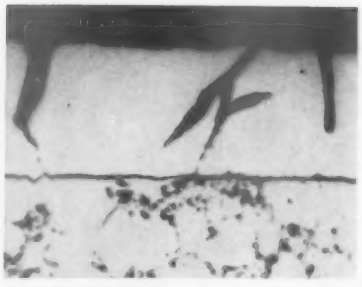




POROUS CHROME is of two types. This photomicrograph shows the pocket type. This is generally used in diesel engines for truck, bus, railroad, marine, power-plant, and certain other types.



CHANNEL TYPE of porosity, like this, is used in aircraft engines. Each type of porosity is controlled to give that percentage of porosity required in a particular engine or service.



CROSS-SECTION shows porous chrome on the cylinder base metal, illustrating the pores which continuously feed oil back to the surface, providing positive assurance of adequate lubrication.

Chromed machine parts last longer

BY DAN HAACK
Mid-Continent Pipe Line Co.

The author has been employed by Mid-Continent Pipe Line Co. in various maintenance jobs since 1947. He has been district field mechanic, assistant to the superintendent of the mechanical department, and is now assistant to the superintendent of the communications and electrical department while serving in an advisory capacity to the management on machinery maintenance problems. He studied mechanical engineering at Oregon State in 1942 and in 1944 was graduated from the Air Force Aircraft Maintenance Engineering School, Yale University. He has had experience since 1937 with automotive, aircraft, and industrial engines.

CHROMIUM'S most important use is not for shiny auto bumpers or kitchen dinette sets, but as a long-wearing surface on industrial machinery parts where it is seldom seen by the human eye.

Mid-Continent Pipe Line Co. has invested heavily in chrome plating for a great many components of pipeline machinery. Engine cylinder liners, reciprocating pump liners, engine and pump crankshafts, pump piston rods, pump crosshead pins, and engine camshafts are a few of these many applications. In short, if it wears, we chrome plate it.

The various uses of chromium add up to one of the most important phases of our preventive and replacement maintenance program. We have already accomplished, or have reasonable assurance of accomplishing, the following objectives for our equipment:

Cylinder Life Increased

We believe porous chrome-plated walls will outlast conventional cast-iron surfaces three to five times. Thus, a chrome cylinder wall may have a reasonable life expectancy of 110,000 operating hours or more, based upon optimum wear rates of our present engines. Most industrial engines are equipped with removable wet-type cylinder sleeves which can then be inexpensively shipped to the plating plant for chemical stripping and rechroming.

Sleeves can thus be plated over and over, each time returning the bore size to standard diameter and thus avoiding oversize pistons and rings. The only limit to the number of platings is the fatigue limit of the base metal itself and possible corrosion damage to the sleeve's outer surface exposed to the coolant. Cost to chrome plate is estimated to average 60% to 85% of the cost of new replacement parts.

Piston Ring Life Increased

Plain cast-iron piston rings operated in porous chrome-plated cylinders have a 60% greater life expectancy than the same rings operated in conventional cylinder walls. This is due to lower coefficient of friction between ring material and cylinder wall, and improved lubrication over that of conventional wall-ring combinations. The use of chrome-plated piston rings in cast-iron liners is also effective, but not nearly so good as having the chrome on the cylinder wall instead of on the rings.

Tests made by a prominent manufacturer of piston rings have indicated the chrome liner-cast iron ring combination has a relative life four to five times greater than the plain liner-chrome ring combination, all other factors being equal. Under no circumstances should chrome-plated piston rings ever be used in a chrome-plated cylinder as immediate destruction to both wearing surfaces will result. The only suitable ring material for chromed cylinders is grey cast iron. Malleable iron, centrifugally cast iron or steel are all incompatible with chrome.

Engine Lube-oil Consumption Reduced

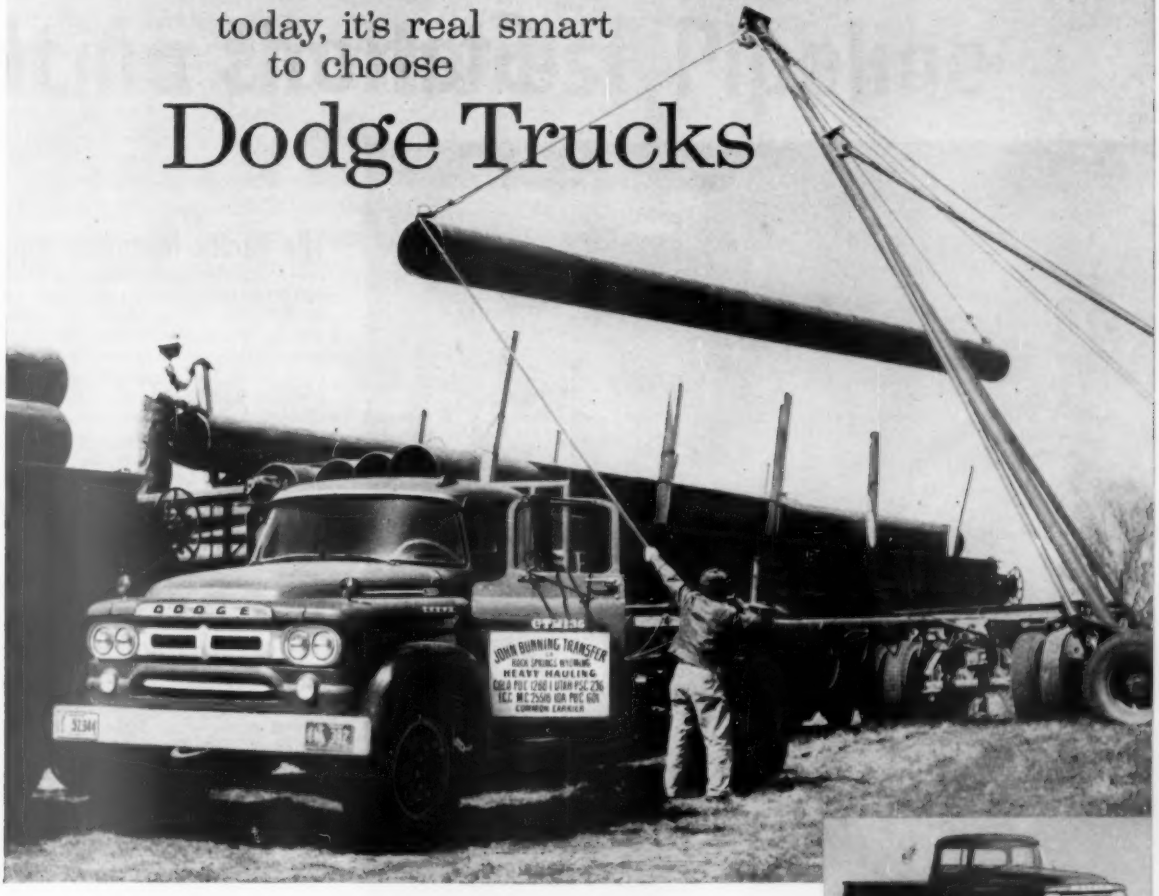
Oil consumption is lowered an average of 30% by chrome-plated cylinders. This is due to better mating

Makes tough jobs a "pipe"

Heavy hauling jobs in the oil fields get a lot easier when your truck is a real heavy-duty truck that's built for brutal going. Dodge Power Giants, for instance, offer horsepowers up to 234 . . . G.C.W.'s to 65,000 lbs . . . auxiliary transmissions that give up to 20 forward speeds . . . more powerful air brakes. Even the instrument cluster, with graduated oil and ammeter gauges and tachometer, is specially designed for heavy-duty truck operation.

You get the easiest, quickest delivery of heavy-duty trucks from Dodge, too, through Dodge's growing network of Truck Centers. Ask your Dodge dealer about it. He has dozens of big, powerful reasons why . . .

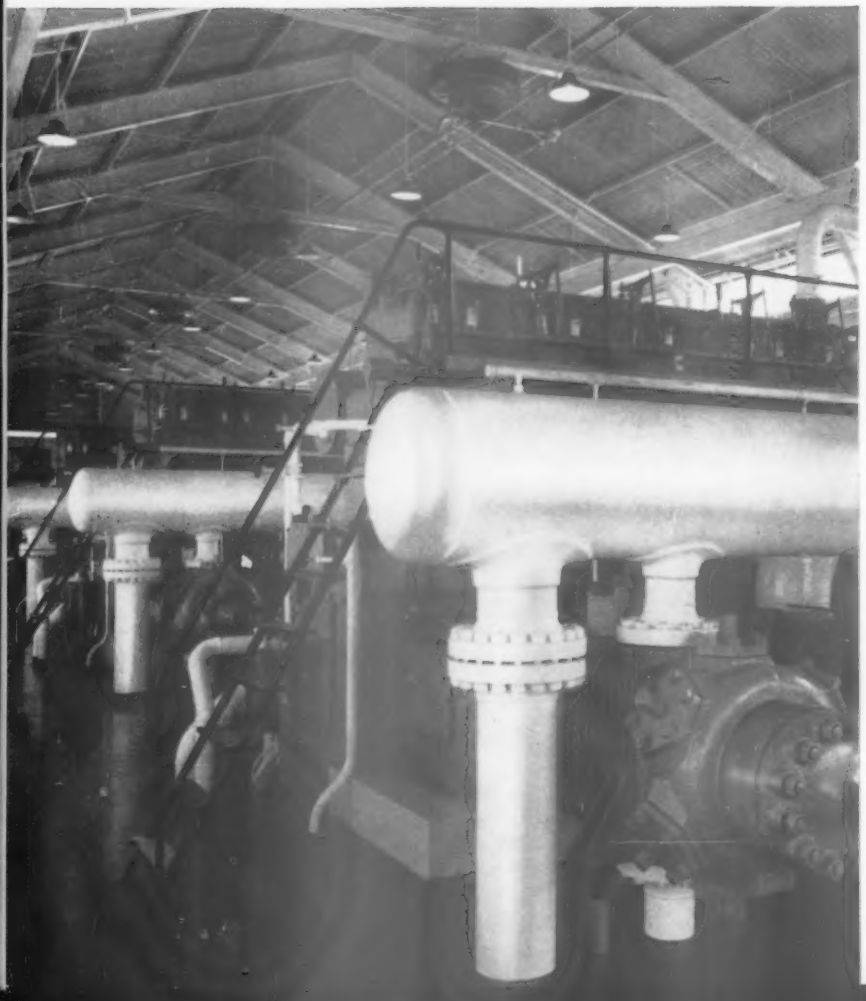
today, it's real smart to choose Dodge Trucks



Four-wheel-drive Dodge Power-Wagons go wherever your job is—on or *off* the highway. Front-wheel drive locks out for ordinary highway use. Power winch, power take-off, pintle hook and brush guard available to meet your special needs. Real load carriers, too . . . G.V.W.'s to 20,000 lbs.

Station No. 7, at Kemmerer, Wyoming, rated at 5,060 hp, is 7,325 ft above sea level. Mayari R suction and discharge headers and pulsation dampeners are in the foreground.

Bethlehem Compressor Station Stations on the

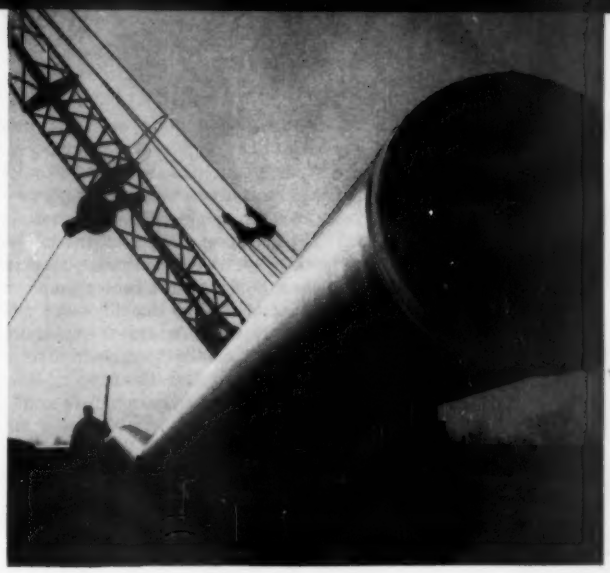


The Pacific Northwest Pipeline ranks with the most challenging of all pipeline projects—in total length, in size of pipe, in difficulty of the terrain, in severity of weather encountered during construction, and in the speed with which the job was completed. The remarkable success of the planners and constructors in overcoming obstacles is well-known to all pipeliners.

The 1,487-mile main line (26-in. OD) is unusual in that it is supplied at both ends, as well as at various intermediate points. Its southern terminus is at Ignacio, Colorado, in the San Juan Basin. Its northern terminus is at Sumas, on the Canadian border, where it ties in with a line from the Peace river fields. Gas is also delivered from the Piceance Creek and Rangely fields in Colorado, and Wyoming's Big Piney. Laterals bring total length of the line to well over 2,500 miles.

Fish Engineering Corporation handled all of the design, engineering, and station layout work, while Fish Northwest Constructors, Inc., were responsible for construction of the stations as direct agents for the owner, Pacific Northwest Pipeline Corporation.

This is Compressor Station No. 1 at Ignacio, Colorado, with 22-in. OD Mayari R suction and discharge bottles in evidence. Largest station on the system, its seven 2,000-hp units discharge gas to the line at 800 psi.



IN NEW JERSEY—36-in. OD Bethlehem line pipe being installed for a major transmission line. Numerous pipeline companies are already considering the economies of 42-in. pipe now available from Bethlehem.

Pipe Was Used at All Thirteen Pacific Northwest Pipeline

THERE are thirteen compressor stations, totalling 82,780 horsepower, along the 1,487-mile main line of the Pacific Northwest Pipeline. For these vital installations the Fish Engineering Corporation specified Bethlehem's Mayari R compressor station pipe—*exclusively*. It was used in 22-in. and 26-in. sizes for suction and discharge lines, headers, and bottles, and for pulsation dampeners.

Why? Because Mayari R high-strength, low-alloy steel is extremely strong (yield point, 50,000 psi min) and ductile (22 pct min elongation in 2 in.). It's highly recommended for applications subject to high pressures, pulsation, and vibration. And it's readily weldable, too.

Mayari R pipe is available in diameters from 18 in. up. It does not require heat treatment. Bethlehem supplies Mayari R plate to fabricators of elbows, tees, flanges, and other fittings.

Line Pipe to 42 in. OD. At Steelton, Pa., we produce API pipe, electric-fusion-welded and hydraulically expanded, from 18-in. to 42-in. OD, with walls to ¾ in. in all diameters. Electric resistance-weld pipe from 5$\frac{9}{16}$ in. to 16 in. OD, and continuous buttweld pipe from ½-in. to 4-in. nominal, are produced to standard API line pipe specifications on our Sparrows Point, Md., pipe mills.

For more information about Bethlehem line and compressor station pipe, please contact the Bethlehem sales office nearest you. Ask for a copy of our new publication, Booklet 519, containing useful design tables concerning sizes 18 in. to 42 in., inclusive.

IN CALIFORNIA—Lines of Beth-Co-Weld pipe carry product from 24 wells to an automatic trap farm. Many miles of this reliable line pipe are used each year by the oil and gas industries.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

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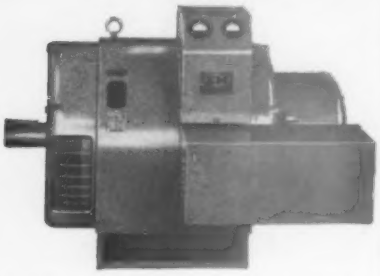
Get the latest!

A COMPLETELY NEW "PACKAGED" GENERATOR

AMP-PAK



AMP-PAK Generator shown is rated at 187 kva, 1200 rpm, 240/480 volts. AMP-PAK is available in ratings of 75 thru 187 kva at 1800 rpm and 62½ thru 187 kva at 1200 rpm. Three phase, 80% PF, 60 cycles, 50C rise, and 120/208, 240 and 480 volts.

No exciter... No moving parts in the voltage regulator

AMP-PAK is a compact, revolving field a-c generator with built-in, static excitation system; static voltage regulator; and basic metering and controls conveniently grouped. AMP-PAK is a portable unit, factory assembled, internally connected, and tested.

No rotating exciter to maintain. D-C excitation is provided by a heavy duty, long-life, static rectifier.

No tubes, relays, vibrators to service. Voltage is regulated by a static, E-M-developed sensing circuit and "magical" magnetic amplifiers.

Holds voltage "rock-steady" so your motors, lights, and electronic equipment will work better. The static regulator provides ±2% regulation.

Starts big motors. A special, built-in voltage booster transformer stands by to reinforce line voltage when heavy loads are suddenly applied.

Easy to install. Needs no switchboard. Just connect load to AMP-PAK thru a suitable line switch.

Simple to operate. Has no belts, no "tricky" commutator, no adjustments – anyone can operate AMP-PAK.

See your nearest E-M Sales Engineer and write the factory for publication PRD-236.

ELECTRIC MACHINERY MFG. COMPANY
Minneapolis 13, Minnesota

Largest manufacturer of "Packaged" Generators

2100-TPA-2154

of rings and cylinder walls, and the presence of a depth of lubricant in the "pores" of the porous chrome plating. Also since wear is so greatly reduced, the beginning of excessive oil consumption is proportionately long delayed. Another reason is that a chrome surface runs cooler than an iron or steel surface due to lower coefficient of friction and as much as 340% faster thermal conductivity.

The result is less thinning of the lube oil in the high-temperature zone, and correspondingly less escape of this thinned oil past the rings into the combustion chamber. There are some platers who claim to be able to actually preselect any lubricating-oil consumption rate desired by the customer. Numerous case histories in our files indicate this objective has been achieved in several instances, particularly in aircraft engines.

Engine Thermal Efficiency

There is an additional thermal characteristic of chromium that strongly favors plated cylinders, rather than plated piston rings. Paradoxically, chromium rates very high on both heat conductivity and heat reflectivity. That is, the conductivity permits the rings and cylinder walls to run cool, but at the same time the reflectivity tends to keep the heat of combustion from escaping into the cooling system. This promotes more efficient combustion of the fuel, as well as raising the over-all thermal efficiency of the engine.

The result is more power delivered to the drive shaft per fuel dollar. Some operators have carried this principle to its ultimate conclusion; namely, to even plate the piston crowns and thus increase the cylinder's heat retention to the maximum possible.

Life Increased

Modern copper lead and aluminum bearings give their top performance only on extremely hard (Tocco hardened, etc.) crankshaft journals. Chrome, being next to the diamond in hardness (66-70 on the Rockwell "C" Scale) is ideal for this purpose. Chromium is extremely "slick," and has great resistance to sticking, pick-up, and galling. Less horsepower is lost to friction, and gone forever are the expensive and troublesome undersize bearings that must be used on reground plain crankshafts.

It is often not realized that the average service life of undersize bearings is substantially less than that of standard-size bearings. This is due to the extra thickness of the bearing shell in the undersize insert, which is then rendered more susceptible to fatigue. The greater the undersize, the shorter the ultimate life of the bearings. The cost to chrome plate a crankshaft is usually 50% to 70% of the new shaft price for most pipeline engines. The larger engine, the greater will be the savings in most cases.

Engine Camshaft Journals

We have obtained excellent service from reconditioned camshafts. The standard technique is to restore the bearing surfaces by hard chrome plating, and then build up the worn lobes with other wear-resistant metals. (At this time, it is not believed feasible to chrome plate the lobes due to impact type of loading applied to these surfaces.) The rebuilt camshafts have outlasted new ones in our service, yet the cost is substantially less than for new parts.

Pump Crosshead Pins

If the least crosshead "play" develops in reciprocating pumps operating under high hydraulic pressures (800 to 1,200 psi.), severe pounding loads are imposed upon pump gears, bearings, and piston rods. Moreover, these "hammer blows" can be transmitted hydraulically into the product stream, where they may appear as "water hammer," or so called "pipeline surge." The damaging effects of these fluid shock waves are well known to all pipeliners.

By hard chrome plating the pump crosshead pins when they are worn, we can get greatly increased performance in a very critical location. The early thinking on this application for chrome plating indicated it might not be successful due to the "impact"-type loading. However, no failures have occurred in this respect, and the technique is now standard with our company for all reciprocating pumps.

Chrome-Plated Pump Liners

Most of our reciprocating pumps are equipped with replaceable cast-iron cylinder liners in which we usually run cast-iron pistons and porous chrome-plated piston rings. This combination gives good service for pumping most average crude oils which have a certain degree of lubricity. However, when the product is natural gasoline, certain distillates, LPG, or other high-gravity liquids, the metal rings and liners may rapidly wear out, sometimes in a matter of hours.

We have largely overcome this problem by hard chrome plating the cylinder liner and substituting a fibrous plastic-cup piston in place of the cast-iron piston. The hard, smooth, dense chrome-plated liner surface resists the roughening action of abra-

sives and insures exceptionally long cup life. We are currently experimenting with chrome liners and high-pressure synthetic-rubber "slush pump" pistons for high-pressure crude service. Early indications are that this combination may in time supersede metal rings for all types of products, irrespective of their lubricity.

Pump Piston Rods

The piston rods ("polish rods") of reciprocating pumps provide a very useful application for dense chromium plate. These members slide in and out of packed stuffing boxes from 50 to 100 times a minute, depending on the size and design of the pump. Standard manufacturer's rods are usually made of cold-rolled steel which rapidly wears and "grooves out," particularly when pumping products having poor lubricity, or when wind-borne dirt or other abrasives get on the polish surfaces, or imbed in the packing.

When the rods become rough and scored, the fibrous stuffing box packing is soon eroded, and excessive gland leakage takes place. It is of the utmost importance to keep stuffing-box leakage to a minimum, as pipeline pumps operate at pressures up to 1,200 psi., and sometimes are unattended for one or more shifts. A bad leak of an inflammable liquid under such pressures could easily result in a disastrous fire and/or serious loss of product.

Several years ago we used cold-rolled steel rods almost exclusively and found they had an average life in our service of about 5,000 hours. We are getting 15,000 hours and up with hard chrome-plated rods. One particularly important aspect of chromium in this application is that it goes on "cold." Various surface-hardening techniques requiring heat treatment have not been successful in our pumps. The heat treating apparently disturbs the molecular structure of the metal, making it more susceptible to breakage.

We have not recorded a single instance of a chrome-plated pump rod breaking before the normal replacement interval. Moreover, we have found chromium plating to be much cheaper than the other "file hard" surface-hardening methods. The method of electroplating produces a bond usually superior to unions of metal involving heat treatment. If plating is done skillfully, the base metal will disintegrate before bond cleavage occurs, and peeling is thus practically impossible.

References

1. H. G. Braendel, "Chrome Plating Reduces Engine Ring Wear," "Pipe Line Industry," September 1957.

BOOK

TRAFFIC MANAGEMENT. Published by Richard D. Irwin, Inc., Homewood, Ill. 631 pp. $8.70.

This up-to-date book provides the latest information on modern traffic management for any business or industry.

It shows how traffic managers can develop in stature and importance and how they can integrate the traffic needs of their companies with production and marketing requirements. There is full coverage given to all the services available by rail, motor, water, air, and pipeline.

Many new topics are covered in great detail, such as the use of electronic data-processing equipment and scientific research methods, management of private intercity transportation, and conversion to private carriage and leasing versus owning equipment.

S. E. HUEY & CO.

ENGINEERS & SURVEYORS

OUACHITA BANK BLDG.

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SURVEYING & MAPPING

PIPE LINE SURVEYS

HERE ARE YOUR GUIDE BOOKS TO BETTER TRAPPING

DRAINING CONDENSATE FROM STEAM
48 pages on sizing, installation and maintenance of steam traps for any pressure, any temperature, any load. ASK FOR CATALOG K, The Armstrong Steam Trap Book.

DRAINING LIQUIDS FROM AIR AND GAS
How to select and install ball float traps for draining light liquids or water from drip points, aftercoolers, separators, etc., in compressed gas and air systems . . . liquid level control hookups. ASK FOR BULLETIN 289.

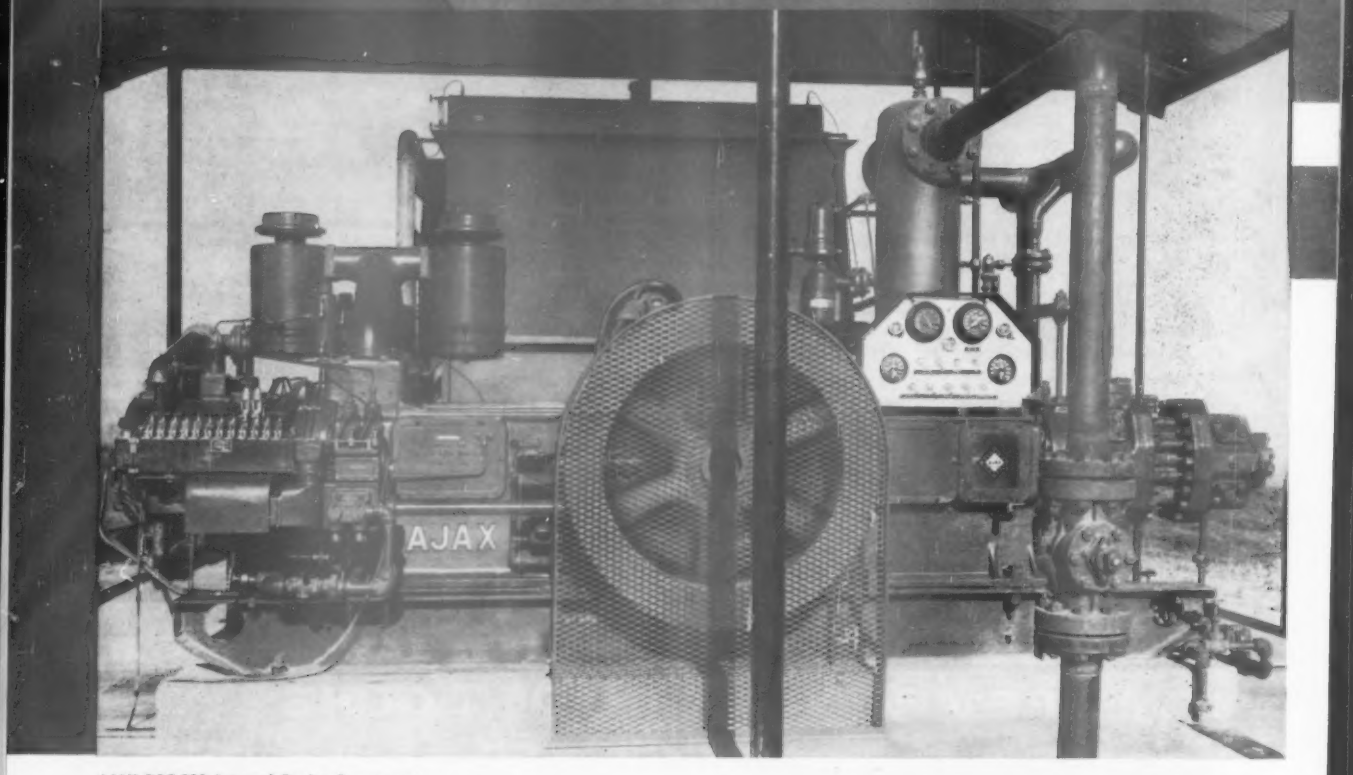
VENTING AIR AND GAS FROM LIQUIDS
Selection and installation of ball float traps for venting air and gas from water and light liquids under pressure. ASK FOR BULLETIN 450.

DRAINING WATER FROM LIGHT LIQUIDS
Dual gravity trap selection and installation explained and diagramed . . . for draining gasoline separators, dehydrator tanks, debutanizers, etc. ASK FOR BULLETIN 209.

Any or all of these helpful bulletins are available on request. Ask your local Armstrong Representative or write direct.

ARMSTRONG MACHINE WORKS
8682 Maple Street • Three Rivers, Michigan
Manufacturers of Inverted Bucket and Ball Float Traps for the Petroleum Industry

New! GAS COMPRESSORS



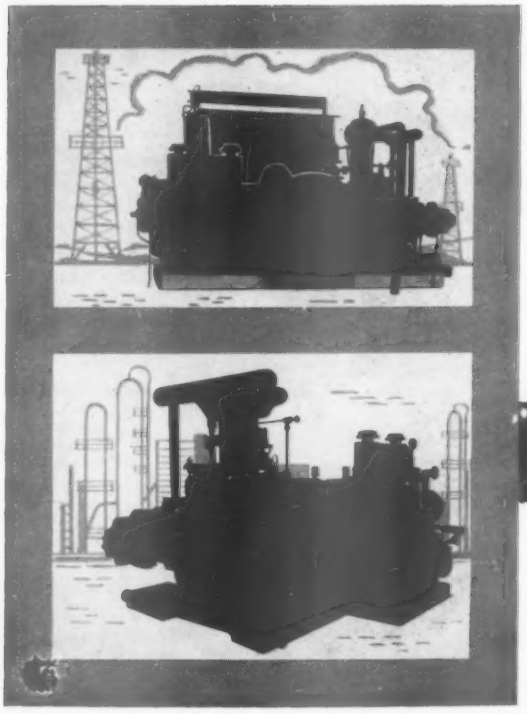
AJAX DPC-230 Integral Engine-Compressor
Twin power cylinders — 13¼" Bore, 16" Stroke — Rated 230 HP at 360 RPM continuous duty.
Twin compressor cylinders — various sizes and 1, 2, 3 or 4 stages as required.

for GAS PRODUCERS

In Gas Gathering and Boosting, Gas Lifting and Secondary Recovery

for REFINERIES, PETROCHEMICAL and GASOLINE PLANTS

In Vapor Recovery and Recycling Operations

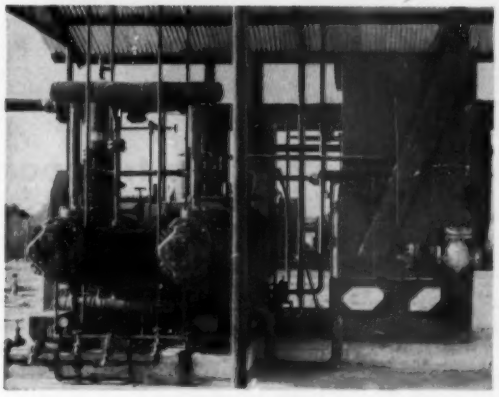


by AJAX

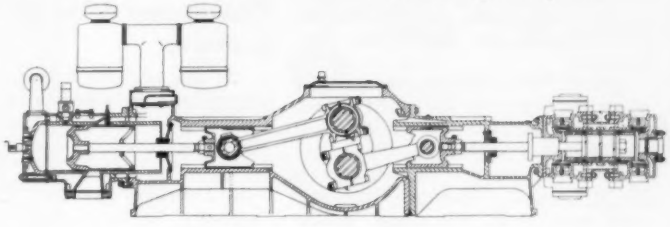
Known for QUALITY Engines - Pumps

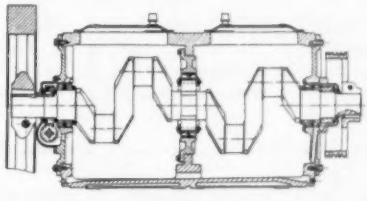
features

- Minimum Vibration because of —
  Horizontally opposed engine and compressor cylinders (shown in illustrations).
  Crankthrows of opposing cylinders set at 180° apart (illustrated in line drawing).
  Oversize crankshaft with 3 main bearings of the renowned Ajax heavy-duty, anti-friction type.
  Massive flywheel. Moderate speed.
- Compressor cylinders of suitable bore, stroke and 1, 2, 3 or 4 stage operation available for every requirement.
- Completely self-contained and mounted, except for cooling unit, on a single skid-type steel base for easy portability and installation.
- Utmost accessibility of all engine and compressor parts for easy adjustment and repair.
- Conveniently located scrubbers and traps, simplified piping and minimum connections facilitate transportation, installation and maintenance.
- Built-in dependability and "Tell-Tale" safety controls permit long-time, unattended operation such as in gas gathering.
- Heavy-duty construction typical of Ajax engines and pumps.
- Unique parts interchangeability within each unit and with Ajax Model DP-115 Gas Engines. Parts availability from Distributors' field stocks.
- Field service provided by Distributors' field organizations in conjunction with Ajax service personnel strategically located throughout the oil fields.



Note convenient accessibility all around both compressor cylinders.





The special design crankshaft, roller bearings, other unique features and heavy-duty construction are apparent in these cross sections.

AJAX GAS COMPRESSORS

AJAX

Since 1877

For additional information send requests to:

AJAX IRON WORKS

19 North Center Street
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Oil Field Distributors

- BETHLEHEM STEEL CO., SUPPLY DIVISION, Tulsa, Okla.
- THE NATIONAL SUPPLY CO., Pittsburgh, Pa.

▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .

Drilling rig is easy to transport

. . . to remote or inaccessible areas by helicopter, cargo plane, light truck or track type of vehicles, or small boats or barges. It is designed into assembly units weighing less than 4,000 lb. each. Suited for drilling at depths to 10,000 ft., the Type 4-10 rig can be converted in the field to a conventional rig by extending the draw works skids and mounting the transmission on the skids at the same level as the draw works and by building new skids for the engines and compounds.

Special bolt fasteners are used for quick assembly of the main frame. No shrink or press fits are disturbed during rigup on disassembly. The draw works frame is sectionalized at the drumshaft centerline. This permits removal of the upper section complete with the sand reel or catshaft to make the drum assembly and brake accessible.

The two-speed transmission is a separate package and independently mounted. The engines are equipped with torque converters. Speed changes can be made without stopping the draw works. An infinite number of speeds are available. **Contact Manufacturer: National Supply Co., Two Gateway Center, Pittsburgh 22, for details on Type 4-10 rig.**

●

Casing and drill-pipe protector

. . . of the latch-on type now on the market can be installed or removed by one man in less than 10 seconds, the maker claims. Called Grip-Lok, the protector employs a hinge design with a locking pin. Synthetic rubber bonded to the inner hinged-steel cage forms a series of interlocking faces at the latching ends of the protector.

The protector is installed by placing it around the drill pipe and using an installation tool to interlock the faces. This aligns the hinge elements for the locking pin. Removal is quickly done by pulling the lock pin.

The protector promises to cut rig time 15 to 30 minutes a trip. Nine sizes are available to fit drill-pipe sizes of 3½ to 5 in. **Contact Manufacturer: Byron Jackson Tools, Inc., Box 2017, Terminal Annex, Los Angeles, for details on Grip-Lok drill-pipe protectors.**

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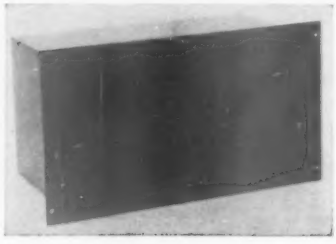


Industrial telemetering system

. . . with exceptional accuracy has been developed that transmits over a single teletype, voice, or microwave channel, or a single metallic pair of wires. The system is designed for sampling and telemetering remote measurements in oil and gas-pipeline systems, industrial processes, and other applications. Its output signal is suited for computer control.

A single ASCOP system consists of a transmitter and receiver which can transmit and receive up to 30 data points with an accuracy of better than 99%. A minimum data system of one point can be purchased and expanded in the field up to the maximum of 30 points for a single transmitter - receiver combination. Plug-in circuit cards make system expansion easy.

Conventional transducers can be used at the transmitter input, and a variety of indicators can be connected to the receiver output. Transducers with output signal ranges of 0.4-2, 1-5, 4-20, and 10-50 ma. d.c. can be used. Outstanding features of the system include automatic correction of complete system errors, positive system-failure indicator, and a hinged front panel allowing easy access to the plug-in circuitry. **Contact Manufacturer: Applied Science Corp. of Princeton, P. O. Box 44, Princeton, N. J., for details on telemetering system.**

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

Described in **OIL AND GAS JOURNAL** - Issue of **July 6, 1959**

NAME.....TITLE.....

COMPANY.....

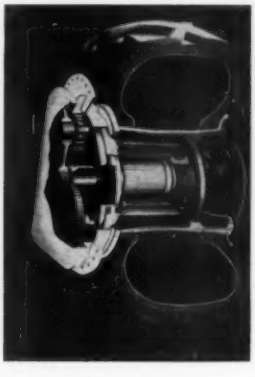
ADDRESS.....

CITY.....STATE.....

Spherical full-opening valve

. . . is now available that is particularly suitable for gas, crude, and product pipelines. Field-tested for more than 5 years, the round-bore Hypresphere valve is less than half as high as a conventional conduit type gate valve.

Consisting of four parts, the valve is made of carbon steel. Moving parts are the operating stem and ball plug. The valve is readily adaptable to power operation, automatic emergency shutoff, or remote control. Flow can be either way. The plug and ring seats are full floating and adjust automatically. One-fourth turn opens or closes the valve. The valve comes in sizes of 16, 20, 24, and 30 in. and in combinations. **Contact Manufacturer: Rockwell Mfg. Co., 400 North Lexington Avenue, Pittsburgh 8, for details on Hypresphere valves.**



Wheel with built-in motor

. . . offers a convenient way to move heavy drilling equipment. The new drive is designed for large off-highway vehicles. It does away with the need for transmissions, axles, and gear shifts. The electric traction motor is an integral load-carrying part of the wheel. It can be powered by a direct-current generator driven by a vehicle's engine. The wheel provides dynamic braking. With the dynamic brake, large vehicles going 35 m.p.h. can be stopped in about three vehicle lengths.

The wheel uses a 45-in. rim upon which large tubeless tires mount. The motor will develop 380 rim hp. Maximum speed for a 125-ton vehicle is 35 m.p.h., using four of the motorized wheels.

The wheel can be bolted to the frame of a vehicle at any location consistent with the vehicle design. Motor frame and gearbox are an integral unit upon which the wheel bearings and rim are directly assembled. The motor is a conventional traction design direct-current series-wound machine. **Contact Manufacturer: General Electric Co., Schenectady 5, N. Y., for details on motorized wheel.**

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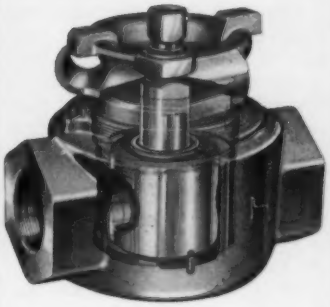
Subsurface production pumps

. . . recently announced are designed to cover a broad range of oil-well pumping conditions. One pump, called the Hydralift, comes in three basic types of subsurface pumps—fluid re-



READ THESE FACTS ABOUT THE NEW HAMER D SERIES HIGH PRESSURE PLUG VALVE

1. **No adjustments needed.** There's no taper to adjust. It's the first successful high pressure valve using a cylindrical plug.
2. **Plug can't stick or freeze.** Elastomer backing on seat segments permits micro-floating effect. Design insures free-turning plug under all operating conditions.
3. **Can be rebuilt right in the line in 10 minutes.** Low-cost factory replacement part kit permits reconditioning the valve to like new efficiency.
4. **Parts reversible**—can't be installed backwards. Seat segments may be turned end for end and still fit properly. Also parts are interchangeable within any given size.
5. **Valve weighs less, costs less**—approximately 40% lighter than similar service valves. It is smaller in size. And it costs 20% to 40% less than similar service valves.

Hamer VALVES INC.
P. O. Box 1851 • 2919 Gardenia Ave., Long Beach 1, California
Representatives throughout the World

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Name_____
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Company_____
Title_____
City_____ Zone____ State_____

P59-5

trievable, insert, and casing types. These will handle capacities to 1,500 bbl. a day and lifts to 15,000 ft.

The fluid-retrievable pump has no mechanical connection with the surface. It can be circulated in and out of the well for inspection and repair. The pump seats in a cavity which is run in on the tubing string, with a second connection to the surface through a macaroni string. In normal operation, the power fluid is pumped down the macaroni tubing, with the exhaust and well-production fluids returning up the large string.

The insert pump is run into the well on a string of macaroni tubing and landed on a tapered seat or in a seating nipple at the end of the main tubing string. It is especially designed to replace sucker-rod pumps. The casing pump is particularly suited for installations where large-volume production is required—up to 1,500 bbl. a day. In general, it is a larger version of the insert pump.

The Centrilift submersible pump is a sealed pump-and-motor package that is submerged in the production fluid on standard tubing through which the pump discharges to the surface. A cable supplies power from the surface starter unit to the submerged motor. This pump operates at setting depths to 12,000 ft. Capacities range up to 17,000 bbl. a day. **Contact Manufacturer: Byron Jackson Tools, Inc., Box 2017 Terminal Annex, Los Angeles, for details on subsurface production pumps.**

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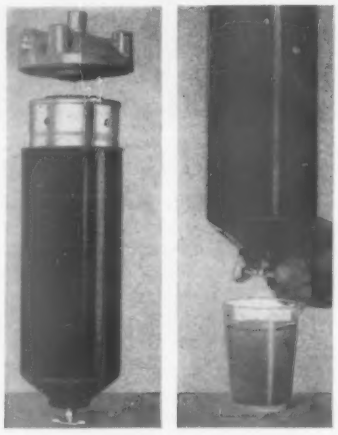

New type of compressed air filter

. . . now obtainable removes moisture, oil, and other contamination from compressed air by separation rather than absorption. Easy to install, the filter may be used in air lines with working pressures up to 125 psig.

Accumulated water and oil can be drained off periodically. The cartridge is easy to change. **Contact Manufacturer: Fram Corp., Providence 16, R. I., for details on air filter.**

•

On-off production tool now available

. . . is designed to provide a positive method of latching the sucker rods to the pump in the well and of unlatching them at the will of the operator. The tool is threaded to fit ¾-in. API sucker-rod boxes and pins.

Constructed of high-tensile-strength steel with good corrosion resistance, the tool is designed to be run in 2-in. tubing. Approximate price of the tool is $127, f.o.b. factory. The tool is available for immediate delivery. On special order, other sucker-rod sizes are available and material can be stainless steel. **Contact Manufacturer: Hooks Machine Works, P. O. Box 557, Selman City, Tex., for details on On-Off tool.**

THERE ARE ALL KINDS OF

CEMENT...

BUT JUST ONE BEST

CEMENT ADDITIVE

FOR OIL WELLS!

ONLY Strata-Crete 6 ® TRADE MARK

GIVES YOU ALL 6!

This improved perlite cement additive generally ***lowers fill-up cost,*** and is ***easier to place*** (requires only normal pump pressures). ***Superior bridging qualities*** and light weight assure complete fill-ups, and the greater resiliency ***reduces fracturing and shattering.*** Strata-Crete 6 can be used with ***any type or brand of cement*** and in itself is ***not affected by high well temperatures.***

Strata-Crete 6 can be obtained from your oil well cementing service company.

GLC

GREAT LAKES CARBON CORPORATION

MINING & MINERAL PRODUCTS DIVISION — STRATA PRODUCTS DEPARTMENT

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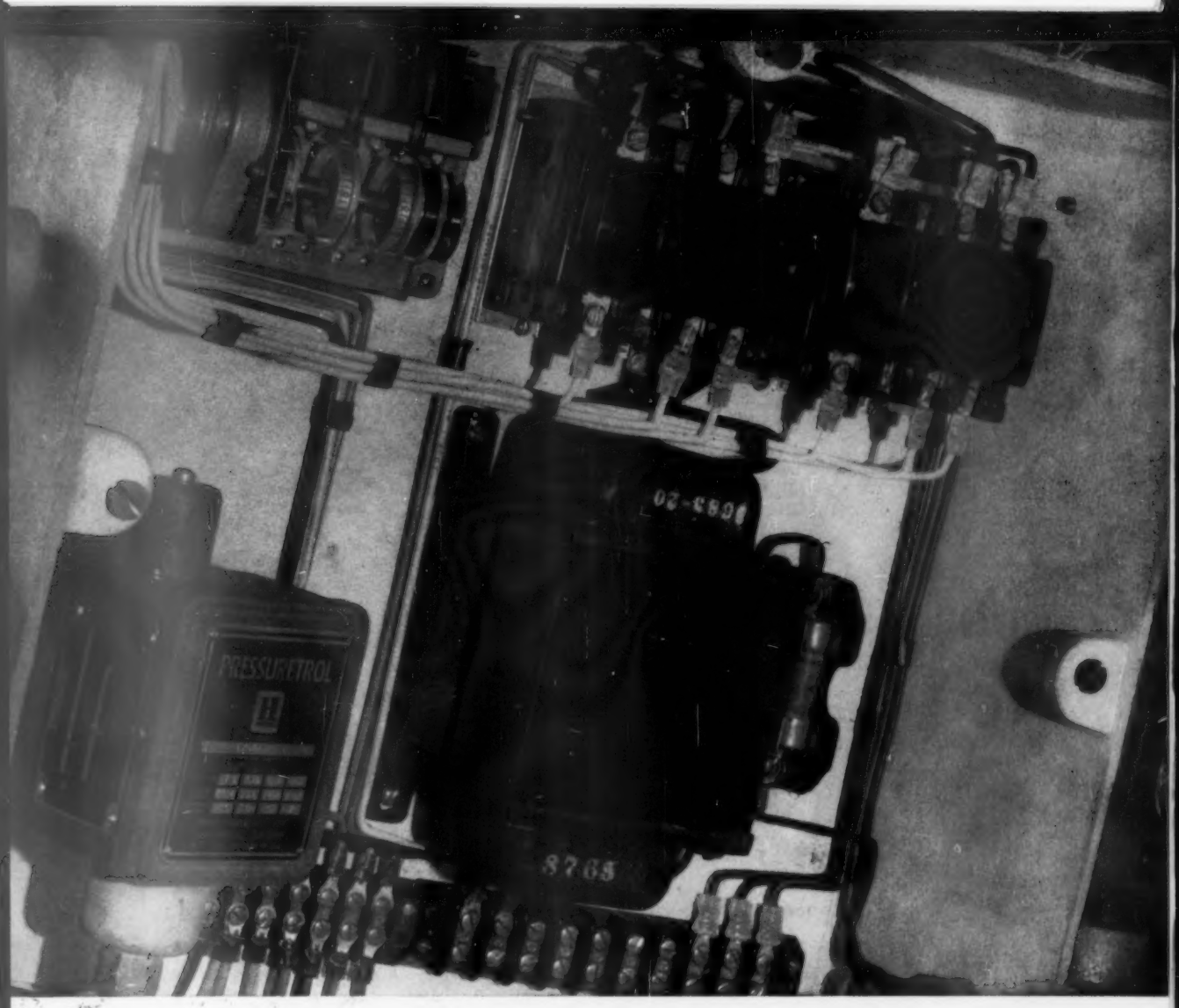


For "set it and forget it" gas drying—

Come to Kemp

Kemp Dryer protects instrument lines at −25° for Quaker State's Farmer's Valley, Pa. plant. Fully automatic operation saves time and manpower, yet provides dependable service on a 24 hour basis.

Here's the nerve center of every Kemp Fully Automatic Gas Drying Unit. Drying process gasses and inerts . . . air for pneumatic instruments and tools . . . liquids . . . for pressurizing anhydrous liquids . . . this panel controls the Kemp Dryer surely and safely. Once timed to meet your program, it provides efficient drying on a continuous basis, without worry or excessive maintenance.

Note the precision with which even the wiring is connected. It's typical of the thorough workmanship going into every component of the Kemp Dryer. Kemp Dryers are built with care; built to last and perform year after year with dependability resulting from a quarter century's experience.

Whether your operation calls for a completely automatic Kemp Dryer, a semi-automatic model, or a simple, manually operated unit, there's a model and capacity to meet your needs. Kemp Field Engineers will gladly study your problem and make complete recommendations, even down to the proper desiccant (we select from over 20) to do your job best.

Your Kemp Representative is listed in *Chemical Engineering Catalog*. Call him for full information when you plan a new installation or wish to update an old one. Or write for Bulletin D-102. THE C. M. KEMP MFG. CO., 405 E. Oliver St., Baltimore 2, Md.

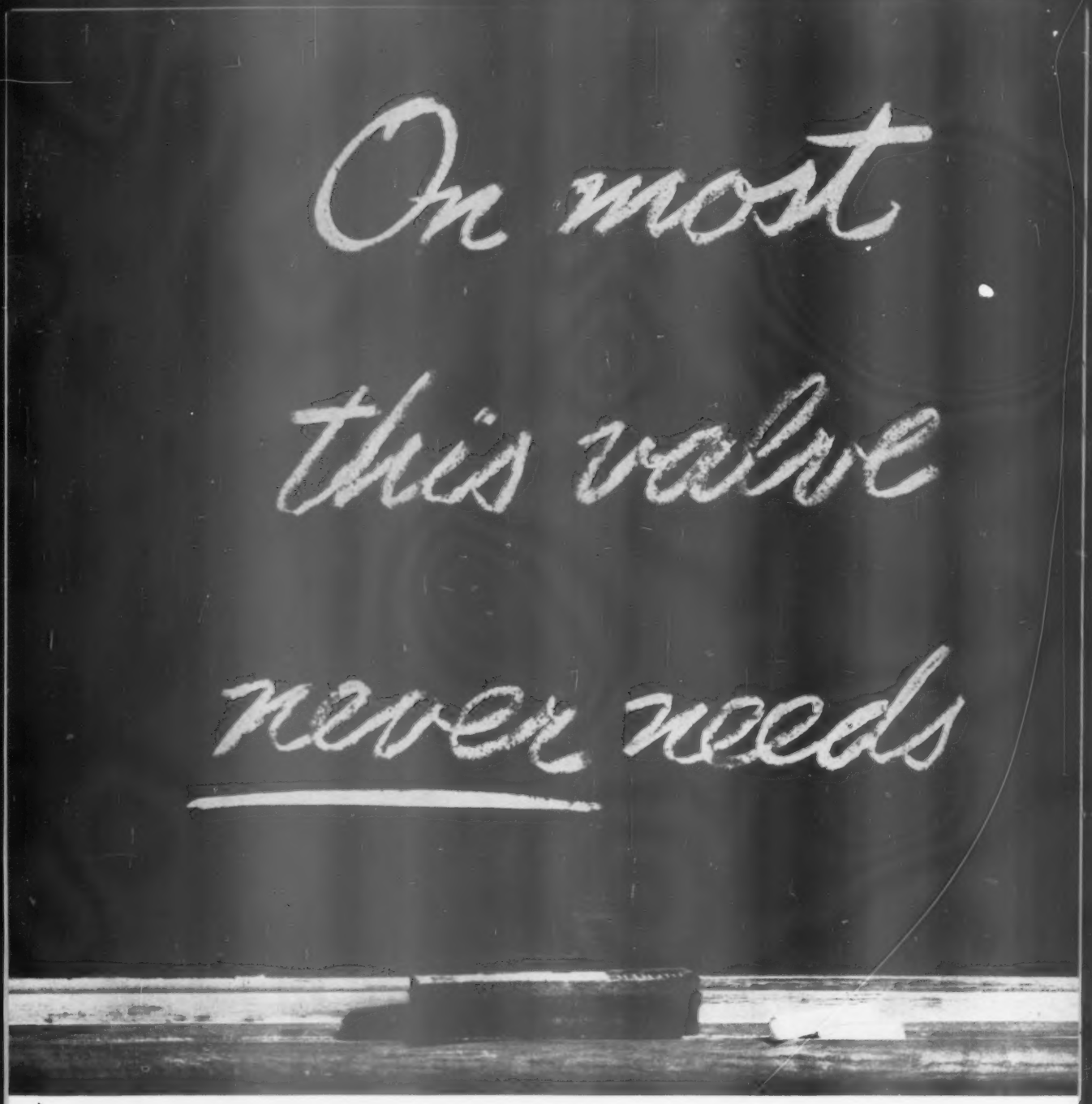
Convection Dryers

Inert Gas Generators

KEMP BALTIMORE

Nitrogen Generators

Oriad Dryers



There are a few valve-killing services where Rockwell-Nordstrom valves *do* fail—after outlasting non-lubricated valves by ten or twenty times. But on *most* services—when properly specified and properly maintained—they last as long as the installation of which they're a part. This is why: Rockwell-Nordstrom valves are *lubricated*. Pressurized lubricant in the Sealdport system does three things. 1) It creates a powerful leak-proof seal that can't be permanently damaged because it *renews itself*. 2) By hydraulically cushioning the plug, lubricant *prevents freezing and jamming*. 3) Lubricant protects every moving part against wearing *friction* and no vital part is exposed to the line. The lubri-

Lubrication makes the

cation largely eliminates the *causes* of valve failure. How much would you save if you had a valve that never needed to be replaced—or that outlasted your present valves by ten or twenty times? Try just *one* Rockwell-Nordstrom Valve on your toughest service. *Rockwell Manufacturing Co., Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Ltd.*

ROCKWELL-Nordstrom VALVES

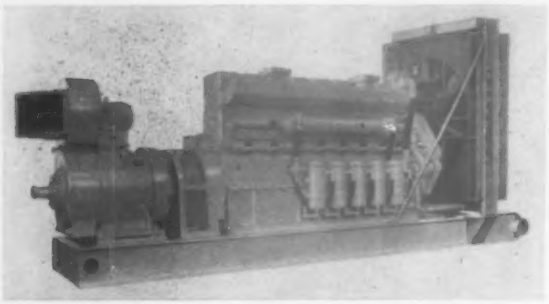
another fine product by

ROCKWELL

difference . . . . . .

Tractor for geophysical exploration

. . . now available permits mounting a drill on the rear and the use of a power takeoff to power the drill and an air compressor. The four-wheel-drive tractor is powered by a 182-hp. gasoline engine. Its 16.00x20 in. tires provide flotation for the difficult terrain often encountered in geophysical exploration. **Contact Manufacturer: FWD Corp., Clintonville, Wis., for details on Blue Ox flotation wheeled tractor.**



Gas engine-generator package

. . . for drilling rigs now being marketed provides a continuous power rating of 408 kw. at 1,020 amp. and 400 volts. Twelve engines are available. They can be operated on gas, diesel, or dual fuel. Two basic sizes of generators, various electric motors, and tailored control components are obtainable.

The power units can be obtained in groups of two to four in building-block fashion. A simplified electrical system provides individual motor control through compact rectifiers and over-all control through an integrated package that fits into the usual driller's console. The variety of components permits selection of either an electric or an electromechanical system. **Contact Manufacturer: White Motor Co., Springfield, Ohio, for Bulletin 123.**

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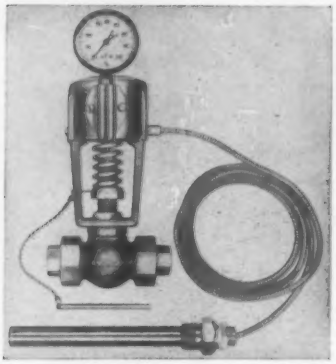

Self-operated temperature regulator

. . . now on the market controls temperature through the throttling action of its valve on a steam or water line. Responding instantly and powerfully to temperature change, its corrective stroke begins with less than one-tenth of a degree change in temperature at the bulb.

A virtually friction-free bellows seals the valve stem, doing away with stem binding common to stuffing boxes. Internal safety spring protects regulator from damage due to accidental overheating.

Regulator comes in indicating and nonindicating types in ½ to 2-in. sizes with ranges from −15° to 50° to 240° to 350° F. Bronze, stainless-steel, and plastic-coated systems are available. **Contact Manufacturer: Manning, Maxwell & Moore, Inc., Stratford, Conn., for details on temperature regulator.**

●

Three-inch PVC Y-globe valve

. . . check valve, and strainer are now being manufactured. The maker recommends the PVC valves for low and medium pressures—150 psi. at 72° F. Advantages of the PVC products are that they are considerably lighter weight than metal valves. PVC weighs about one-sixth that of steel, permitting a possible reduction in installation costs. It is highly corrosion-resistant, making it particularly suitable in chemical-plant service. **Contact Manufacturer: Walworth Co., 750 Third Avenue, New York 17, for details on 3-in. PVC valves.**

Send this **Showcase Coupon**

to the Manufacturer of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

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Described in OIL AND GAS JOURNAL - Issue of July 6, 1959

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Quality made Larkin the leader, and you can buy, or sell Larkin Fittings with full confidence that they are the finest fittings made.

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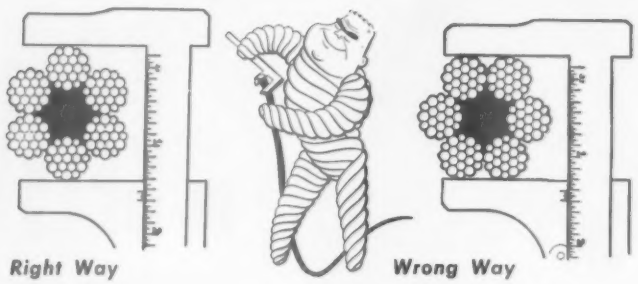
LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

Tuffy® Wire Rope Tips

When Sheaves, Sockets and Clips Misfit... Your Pocketbook Will Be Hard Hit

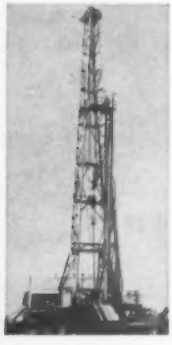
How to Measure Rope Diameter



To get the most service, efficiency and safety out of wire rope operation, rope and sheaves must be precisely fitted to each other. There's only one right way to measure rope diameter: use machinist's calipers and be sure to measure the widest diameter.

A slight shift of the rope in the calipers, as shown above, will give you a misreading which would result in ordering an undersize rope. Note that the measurement at right shows ⅛" under correct diameter. Be sure to double-check every time!

Tuffy Balanced Standard Rotary Line helped drill the world's deepest well—Wildcat I-EE in Pecos County, Texas. This rotary line is famous for top performance in use with standard rigs in any formation. It also does an outstanding job with jacknife rigs in deep drilling beyond 6000 feet.



Tuffy Balanced Jacknife Rotary Line: Made to the special needs of jacknife rigs drilling to 6000 ft. Has extra strength, with greater flexibility to move at higher speeds over the smaller sheaves and drums of jacknife rigs, and to give better reeving and spooling.

How to Check Groove Diameter

No Go

Just Go

Groove diameter of a sheave or drum must never be less than the actual calipered diameter of the new rope. When a new rope is installed on old equipment, use a reliable groove gauge to make sure the tread or bearing surface of all sheaves is of sufficient size to avoid pinching the rope.

Kick Out Worn Sheaves

Old sheaves may never die, but in "fading away" they develop conditions which shorten rope life. Sheaves with grooves corrugated with rope lay impressions should be replaced with new ones before new wire rope is installed.

How to Measure Tread Diameter

Easy, and important. Select the smallest sheave or drum to be used with the new wire rope, and measure actual diameter at lateral center (shortest dimension) of tread.

Tuffy Balanced Slings & Hoist Lines

This team has made a name for cutting hoisting and downtime costs in all types of materials handling. Tuffy Hoist Line gives the balanced combination of strength and flexibility needed for a longer running rope. Tuffy Slings are made of an extra flexible, high-strength machine-braided fabric that smooths out uninjured after knotting or kinking.

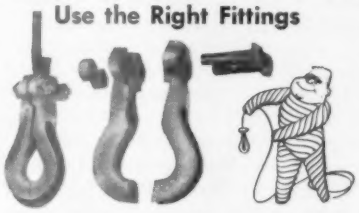
FREE!

Complete handbook of wire rope use in oil field service

Latest, most complete information ever compiled on the subject in one publication. Shows the various rope constructions used by the oil industry, and gives full data tables on each. Includes (in their entirety) "A.P.I. Specifications for Wire Rope" and "A.P.I. Recommended Practice on Application, Care and Use of Wire Rope for Oil Field Service."

Write Union Wire Rope Corporation, 2102 Manchester Ave., Kansas City 26, Mo. Specialists in high-carbon wire, wire rope, braided wire fabric and stress relieved wire and strand.

Use the Right Fittings



Right fittings add life expectancy to wire rope. Fittings which derive holding power from crimping action are harmful.

Shown here is a clamp that has no "wrong side"—can be put on either way. It snugly saddles the rope, grips larger surface area in such a way that loads are carried almost entirely by friction instead of crimping action. Combined in its two parts is a thimble. The parts are interlocked to prevent collapse of the thimble and eliminate all shear on the bolts.

Recommended sizes:

Diameter of Rope	Min. Dia.	Max. Dia.
¼-⅝	+ 1/64"	+ 1/32"
⅜-¾	+ 1/32"	+ 1/16"
⅞-1⅛	+ 3/64"	+ 3/32"
1¼-1½	+ 1/16"	+ 1/8"
1⅝-2¼	+ 3/32"	+ 3/16"
2⅜ and larger	+ 1/8"	+ ¼"

New ropes are usually over-size. It is advisable to have groove diameters of sheaves or drums as large as the actual calipered diameter of the new rope, or slightly larger. We recommend sizes as above charted.

9 Steps to Correct Socketing

1. Securely seize and serve with soft wire ties before cutting, and have at least two additional seizings placed at a distance from the end equal to the length of the basket of the socket.
2. When the rope is properly seized, take off the end seizing. Cut the fiber center back to the seizing, as shown in 1 above. Untwist and broom out the wires. See illustration 2.
3. Clean the wires for the distance they are to be inserted in the socket. Use benzine, naphtha, gasoline or other solvent. Then wash off in boiling water or boiling ammonium chloride used in Step 5.
4. Then dip cleaned wires in commercial muriatic acid to a depth not greater than ¾ of the cleaned length of wire. Keep the wires immersed for 3 minutes, or until the acid has thoroughly etched each wire. Be sure acid does not contact any other portion of rope.
5. Immerse wires into boiling ammonium chloride. A white coating will be left on the wires.
6. Place a temporary tie wire over the ends of the cleaned wire (see illustration 3). Be careful not to get the cleaned wires greasy or oily.
7. Insert the rope end into bottom of socket. Remove temporary tie wire.
8. Holding the rope vertically in a vise, set the socket so that the wires are flush with top of the socket basket and seal the bottom with putty or clay (See illustration 4). Pour in among the wires about ½ teaspoon of sal ammoniac crystals.
9. Pour molten zinc into the basket until it is full (see illustration 5). When zinc is solidified, the seal is removed and socketing complete as shown in illustration 6. The zinc must not be too hot or it will anneal the wires, particularly of small ropes. Temperature must not be above 925° F. Use pine stick test: if stick chars but does not ignite, the zinc is ready to pour. Overheated zinc will have a red color and stick will catch fire. When zinc has solidified sufficiently, the socket may be plunged into cold water.

FREE!

Complete Splicing and Socketing Manual with engineer's notebook on wire rope constructions and specifications. Write for your copy now. Address Union Wire Rope Corporation, 2102 Manchester Ave., Kansas City 26, Missouri.

Specialists in high carbon wire, wire rope, braided wire fabric, stress-relieved wire and strand.

UNION Wire Rope is Balanced for Greatest Efficiency, Service Life and Safety

Every one of the Tuffy Special Purpose Ropes has a different combination of such properties as strength, toughness and flexibility.

That's because each Tuffy is "job prescribed"—made to perform best under the conditions of its special use.

You hear a lot about extra strength in wire rope. It's no trick to design rope with very high strength. The main thing is to get the proper balance of strength with other qualities needed.

Which is just what you get in every Union Wire Rope product. Why settle for less?

Your Tuffy Distributor Will Help You Get All the Extra Service Life We Build Into Wire Rope

UNION Wire Rope

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New steels are born at Armco

2

SHOWCASE . . .

New Literature

Walkie or rider-type trucks

. . . publication gives the pros and cons for both types and how they are used in industry. Advantages and applications of the trucks are outlined, along with a convenient check list giving facts to consider when analyzing truck requirements.

The eight-page literature offers illustrations which show how both the walkie and rider-type fit into a wide variety of material-handling programs. **Contact Manufacturer: Automatic Transportation Co., 149 West 87th Street, Chicago, for Walkie or Rider-Type Trucks literature.**

Internal-gear rotary pumps

. . . are described in four new four-page bulletins and two new two-page units. The literature provides typical liquids applicable for the series and typical drawings of V-belt, direct, and gear-driven assemblies.

Text contains descriptive paragraphs, construction options, and details and specifications for each model in the series. The bulletins include ordering instructions, assembly recommendations, and dimensional details. **Contact Manufacturer: Wayne Pump Co., Div. of Symington Wayne Corp., Griffin Street, Fort Wayne, Ind., for set of six publications on Internal-Gear Rotary Pumps.**

Matching the wire rope to the job

. . . is the title of new four-page Bulletin 107, which provides specific recommendations for the wire-rope construction to use on all types of equipment. In many cases, two or three choices are provided depending on special circumstances under which the equipment is working. **Contact Manufacturer: Leschen Wire Rope Div., H. K. Porter Co., Inc., Advertising Dept., 2727 Hamilton Avenue, St. Louis 12, for Bulletin 107.**

Meter accounting system

. . . for summing multiple-meter flows in the pipeline industry, is described in a new four-page form. The system — called Proportioneers — maintains continuous and accurate printed records from numerous remote meters along the pipeline, simplifying cost-accounting records, according to the literature.

Bulletin SM-3280 contains photographs of the three styles of meter panels, a typical arrangement drawing of the units, several installation photos, and descriptive text on the new method of meter accounting using "building block" construction. **Contact Manufacturer: B-I-F Industries, Inc., 345 Harris Avenue, Providence 1, R. I., for Bulletin SM-3280.**

Wall chart illustrates swing joints

. . . in 28 styles, which are available in sizes 1¼ to 6 in. in bronze, steel, monel, or aluminum. The 18 by 36-in. chart includes prices and weights. **Contact Manufacturer: OPW-Jordan, 2735 Colerain Avenue, Cincinnati 25, for Wall Chart PL-8.**

Nine basic filter-element materials

. . . for a wide variety of air, gas, and liquid-filtering requirements, are described in new four-page Catalog BFD-48, now obtainable. It discusses and illustrates the following elements with cross-section and microscopic photographs: micropleat, microedge, microbon, microfil, microlox, micromesh, poromesh, poroloy, and microglass.

The literature also describes methods of rating and testing filter assemblies, as well as the new clean-room facility for assuring ultraclean metallic filters on a production basis. **Contact Manufacturer: Bendix Filter Div., Bendix Aviation Corp., 434 West 12 Mile Road, Madison Heights, Mich., for Catalog BFD-48.**

Monel family of small tubing

. . . technical bulletin lists the chemical composition, physical constants, and mechanical properties of four materials in tubing form: Monel, "R" Monel, "403" Monel, and "K" Monel. Four-page Bulletin CM-159 gives general characteristics and typical uses of the four analyses. **Contact Manufacturer: Superior Tube Co., 1938 Germantown Avenue, Norristown, Pa., for Bulletin CM-159.**

Ring-balance meters

. . . Bulletin MSP-160 highlights outstanding features of the instruments, keying each to a more detailed technical catalog. The eight-page publication offers graphic discussions of ring-balance applications as: (1) wide-range flow meter; (2) electronic receiver; (3) computer for measurement of net weight of solids suspended in a fluid stream; (4) B.t.u. measurement in a heat exchanger; and (5) measurement of weight flow

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VESSELS
by MASTER TANK & WELDING
FITTED FOR THE JOB
Master's facilities and equipment, plus experience and know-how, assure proven ability to fabricate pressure vessels to rigid engineering specifications. Write—wire—phone MASTER FIRST for the finest in steel fabrication.
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API 5LX HI-TEST
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20" through 30" or larger
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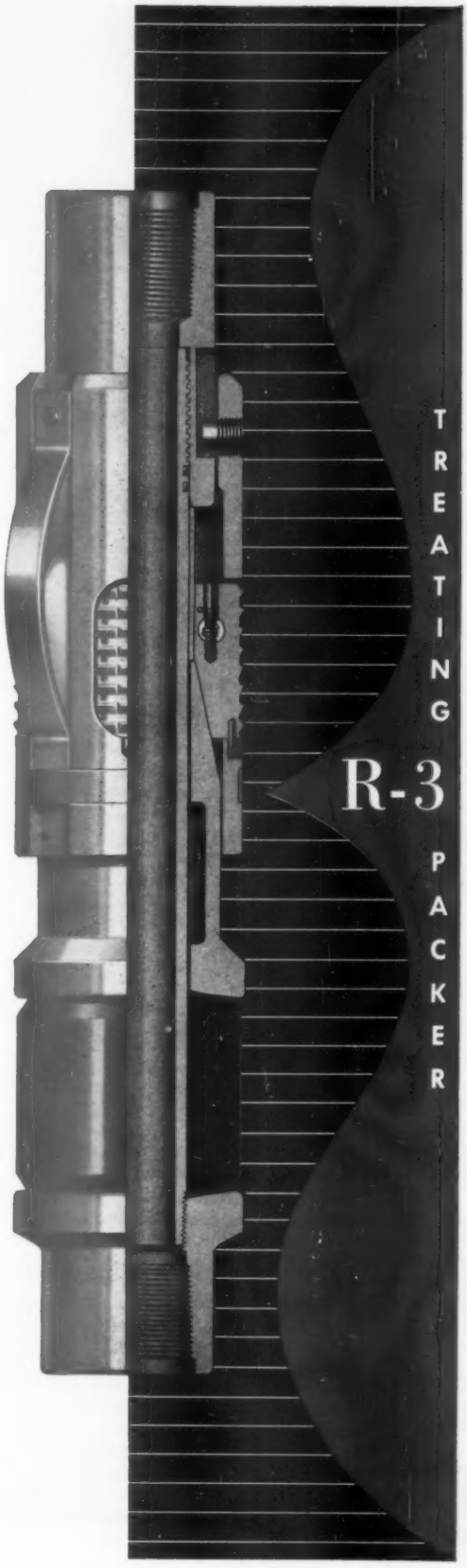

HERE'S THE ANSWER... for shallow well packers!

The new HALLIBURTON R-3 TREATING PACKER for treating, water flooding and producing... can also be used in shallow or low-fluid wells. Short... compact... retrievable ...and dependable, for running on tubing to isolate sections... for *workover and treating* under pressures up to 5000 psi differential. Can be run as tension or compression packer.

The need for tubing hold-down... as in conventional hook wall packers... is eliminated when set in tension since the R-3 *TREATING PACKER* is self-anchoring against pressures from below. When set in compression a hydraulic tubing hold down is used. This arrangement offers the true practical operation for use of this packer at shallow depths.

- Full-opening mandrel permits passage of wire line type tools, instruments or perforating guns.
- Retrievable, may be set and reset on one trip in hole or used from well to well.
- Design makes redressing and replacement of parts a single operation.
- Safety joint allows tubing to be removed. Packer is easily drilled if conditions prevent normal removal.

Halliburton Oil Well Cementing Company now proudly adds the R-3 *TREATING PACKER* to its field-tested and proven line of superior quality packers. From the same engineering skills and years of successful experience, that has made Halliburton *foremost in oil well servicing*, comes this newest tool to fill a specific need.

Call your nearby Halliburton Representative for purchase price and full details on the "money-saving" R-3 TREATING PACKER.

HALLIBURTON

CEMENTING SERVICES

HALLIBURTON OIL WELL CEMENTING COMPANY
DUNCAN, OKLAHOMA

New Kidde carbon dioxide portables awarded highest U.L. rating!

Belleville, N. J. June 1—A spokesman for Walter Kidde & Company announced here today that six of the company's new portable fire extinguishers have been awarded the Underwriters' Laboratories highest ratings for their respective capacities. To those interested in fire safety, this means that, pound for pound, these new Kidde units have more fire-killing power than any other carbon dioxide extinguishers on the market today.

Available in 10, 15 and 20 pound capacities, in either squeeze valve or trigger models, these power-packed Kidde units feature new hose and discharge horn assemblies, which are responsible for their extra fire fighting ability. This hose-horn combination is also being offered as a replacement unit for existing 10, 15 and 20 pound carbon dioxide units, and when attached will upgrade their effectiveness equal to the new ratings.

For more information on these top-rated Kidde carbon dioxide portables write Kidde today.

Kidde

Walter Kidde & Company, Inc.
754 Main St., Belleville 9, N. J.
Walter Kidde & Company of Canada Ltd.
Montreal—Toronto—Vancouver

of gas undergoing density variations.

The bulletin presents discussions of the ring-balance meter with: (1) an integrator impulse generator for control of proportional chemical feed; (2) with special cams for measurement of flow with flumes and weirs, or (3) measurement of high-pressure steam flow by pipeline friction without an orifice. **Contact Manufacturer: Controls Div., Hagan Chemicals & Controls, Inc., P. O. Box 1346, Pittsburgh 30, for Bulletin MSP-160.**

120-page aluminum-welding book

. . . offers a comprehensive survey of techniques of welding aluminum using Aircomatic (gas - shielded metal - arc) and Heliweld (tungsten-inert-gas) processes. The publication—Form ADI 1258—covers the subject from a brief historical note on the first uses of these processes for welding aluminum to the highly specialized aluminum fabrications which are being welded with them today.

Major topics covered include: (1) weldability of aluminum and its alloys; (2) definitions and technical discussions of the two welding processes; (3) selection of proper process for certain job applications; (4) descriptions of manual and automatic equipment; (5) welding power supplies; and (6) safety practices. The book is illustrated with 100 photographs, charts, and detailed diagrams of equipment and techniques. **Contact Manufacturer: Air Reduction Sales Co., Div. of Air Reduction Co., Inc., 150 East 42nd Street, New York City 17, for Form ADI 1258.**

Process moisture monitor

. . . for continuous monitoring or control of water in gaseous streams is described in four-page Bulletin 1845. The literature points out the instrument's operation, applications and specifications. **Contact Manufacturer: Consolidated Electrodynamics Corp., 360 Sierra Madre Villa, Pasadena, Calif., for Bulletin 1845.**

Offshore drilling platforms,

. . . docks and piers are illustrated in a new 24-page booklet, which shows a tested method of designing and building the structures. The literature describes recently completed installations of various structures and discusses plans for a mobile nuclear power plant presently being developed. **Contact Manufacturer: De Long Corp., 29 Broadway, New York City 16, for Mobile Offshore Drilling Platform booklet.**

Then came the holocaust...

It was a fine piece of work . . . a big contribution to petroleum technology! In the face of long-accepted chemical theory, this UOP researcher had done the impossible . . . reacted a paraffin (a supposedly inert material) with an olefin to form alkylate, which has since become a principal component of high-octane gasolines.

But where was the need for such fuels . . . then? They were hardly thought of, much less in demand.

Then came war . . . war in the air! In no time at all, huge fleets of aircraft were gobbling up high-octane fuels on a scale never before contemplated. As is so frequently the case, UOP was ready. Its new process, "HF" Alkylation, enabled refiners to meet these urgent demands . . . by producing veritable rivers of once-so-scarce alkylate.

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EQUIPMENT MEN

IN THE NEWS

Oil Well Supply Division of

. . . United States Steel Corp. has awarded the job of top overseas management to R. L. Armstrong, formerly Rocky Mountain area manager. Armstrong, who will become director of Oil Well Supply Co., Ltd., with offices in London, is a pioneer in the oil business.

R. L. Armstrong

A. S. Finefrock

Replacing Armstrong as Rocky Mountain area manager at Casper, Wyo., is A. S. Finefrock, a 43-year veteran with Oilwell. He previously served as district manager at Billings, Mont. Armstrong joined Oilwell in 1936.

Joe Wharton to manage

. . . the newly established sales office of The Trane Co. at Lubbock, Tex. The announcement was issued by A. C. Menke, vice president. Wharton has had 10 years of experience in the cooling and heat-transfer equipment field.

Honorary Sc.D. awarded

. . . to Dr. John W. Jordan, technical director for Baroid Division, National Lead Co., by Marietta College. Jordan, who holds his Ph.D. in chemistry from Columbia University, graduated from Marietta College in 1934. He joined Baroid in 1951 as manager, research laboratories, advancing to director of research and development in 1955, and to technical director in 1956.

Welch is application engineer

. . . for Clark Bros. Co., a division of Dresser industries. G. B. Welch, who will serve from the Chicago office, joined Clark in 1958 as assignment engineer in Olean, N. Y. According to Avery Van Campen, Chicago district manager, Welch will handle the application of Clark compressors and gas turbines, along with contract liaison between Chicago and the home office.

Three store managers announced

. . . for Jones & Laughlin Supply Division by A. G. Bastian, manager, field operations. Evan Smith will serve at Borger, Tex., B. J. Ford at Pampa, Tex., and W. T. Fleming will be at Rangely, Colo.

Smith was formerly salesman at Borger and joined J&L in 1951. Ford joined J&L in 1948 as storeman. Fleming was first employed by J&L as storeman in 1954.

Claude L. Griffin named

C. L. Griffin

. . . vice president, sales for Security Engineering Division, one of the Dresser industries, according to John C. Helies, president. Griffin was elevated from domestic sales manager, a post he has held since 1958. Before joining Security, Griffin was in charge of international sales for American Iron & Machine Works Co.

Continental-Emsco Co. opens new store

. . . at Lafayette, La. Frank Ellis has been appointed store manager. The store will be under the supervision of Noble D. Lane, district manager, and E. A. Dunn, division manager.

Lane-Wells Co. assigns three

Kirby Gee

. . . to new positions, according to John J. Neale, president. Kirby Gee, formerly vice president, operations, is now executive vice president. James D. Hughes, vice president, sales, has been made special assistant to the president. John Miner, until now with Petro-Tech Service C. A. in Venezuela, has been appointed vice president, foreign-sales exploitation.

J. D. Hughes

John Miner

Gee had been president of Elgen Corp. until it merged with Lane-Wells in 1958. He has been in electric-logging operations for 20 years. Hughes has been associated with Lane-Wells for 18 years, serving successively as sales engineer, division sales manager, general sales manager, and vice president, sales. Miner joined Petro-Tech in 1947. Before going to South America he had been with Lane-Wells of California. Lane-Wells is one of the Dresser industries.

United Oilwell Service, S. A.

. . . formerly a Dowell subsidiary operating in Venezuela, has shifted its assets and business to the Dowell Division of The Dow Chemical International, Ltd., S.A. In Argentina, Dowell services are provided by Dowell Division of Dow Quimica of Argentina, S.A.

Dowell became associated with United at the time the firm was organized in 1945. Controlling interest was acquired in 1954 and in 1959 the remainder of the outstanding United stock was purchased. Management of the two service firms will be handled from Dowell's Houston office.

L. B. Swan, Dowell director and vice president, a former manager of United, will head up all of Dowell's foreign activities. Tromer R. Smith, formerly general manager of United,

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The artist's concept of the patterns of Schlumberger Focused Logging is represented by sharply sculptured sections lifted from the formations surrounding the borehole. (1) Sonic Log (2) Proximity Log (3) Laterolog (4) Microlaterolog (5) Induction Log.

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— Eugene Holman, Chairman of the Board

Esso

Standard Oil Company (New Jersey)

and affiliated companies

P. E. Hilton

R. D. McBrian

R. L. Turner

G. M. Anderson

C. C. Taylor

Baker reorganizes its sales department in order to provide better area customer service. The entire domestic sales staff of Baker Oil Tools, Inc., has been placed under the direction of P. E. Hilton, vice president, formerly central division sales and service manager in Houston.

Three new divisions, southern, northern, and western, have been formed from what was the central and western divisions. Hilton will be assisted in Houston by R. D. McBrian, now assistant domestic sales manager. R. L. Turner, who was assistant western-division sales and service manager, will be northern division sales manager with headquarters in Denver.

G. M. Anderson will continue as western-division sales manager at Los Angeles. C. C. Taylor, formerly assistant central-division sales and service manager, will be southern-division sales manager with headquarters in Houston.

has been transferred to Houston to be general manager of foreign operations for Dowell.

A. E. Plomp is general manager

A. E. Plomp

... of Cardwell Manufacturing Co., Ltd., of Canada with headquarters in Calgary, Alta. Plomp was formerly sales representative in Canada, according to Paul Courtney, president of Cardwell Manufacturing Co., who announced the promotion.

Before joining Cardwell in 1958, Plomp represented Kellog Co. of Canada and then Chiksan Co. of Canada.

Olin McGrew has been named

... district sales and service manager at Farmington, N. M., for McCullough Tool Co. He was formerly district sales representative at the same location. W. A. McCullough, mountain division sales and service manager for McCullough, made the announcement.

Appointment of Robert Mayhew

... as United States sales representative for Stewarts & Lloyds, Ltd., London, has been announced by J. Witham Esmonde, chief field representative for the firm, one of the largest steel pipe manufacturers in Europe, with a yearly production of about one million tons. Nearly one-third of the firm's production is channeled into the oil industry. Mayhew will headquarter in New York and will direct the firm's oil-industry sales in the U. S.

Black, Sivalls & Bryson, Inc.

C. H. Myers

... has announced three executive promotions according to Kenneth W. Lineberry, president. Charles H. Myers has been made industrial-relations vice president, Floyd C. Myers has been appointed Houston vice president, and Paul Bartley was named manager of the oil-field equipment division, Oklahoma City.

F. C. Myers

Paul Bartley

C. H. Myers was formerly vice president and manager of the oil-field equipment division. He has been a vice president and member of the board of directors since 1946. F. C. Myers, before this appointment, was vice president and manager of oil-field sales and service. He has 29 years service with BS&B and has been manager of oil-field sales and service since 1954. Bartley was vice president and general manager of BS&B, Ltd., Edmonton, Alta.

Mission Manufacturing Co.

... appoints Keith C. Snyder as Canadian representative according to Ted Fullinwider, sales manager. Snyder was associated with Jones & Laughlin Supply Division for 6 years and with Drexel Canadian Equipment, Ltd., for 2 years before joining Mission. He will headquarter in Edmonton, Alta.

Canadian Well Services, Ltd.

... of Calgary, Alta., has been made Canadian distributor for Johnston hydraulic pumping units, manufactured by Engineered Oil Tools, Inc., Houston, according to Peck Meier, company manager. The Canadian firm has sales and service locations at Calgary, Olds, Red Deer, Stettler, Edmonton, Drayton Valley, White Court, Valley View, Estevan, Oxbow, and Weyburn.

Mandrel Industries, Inc.

... has agreed to purchase substantially all of the assets of the Texas Division of Clevite Corp., according to George Quist, president of Mandrel. The Texas Division, formerly known as the Texas Division of Brush Electronics Co., manufactures a complete line of seismic exploration instruments. Mandrel will merge the facilities with its Electro-Technical Labs Division in Houston, under the direction of D. D. Mize, vice president and general manager of Mandrel's Houston operations.

J. E. Halferty elected

J. E. Halferty

... vice president of The Ralph M. Parsons Co., Los Angeles, according to Ralph M. Parsons, president. Halferty is manager of foreign operations and has full responsibility for administration of all projects outside the United States. He started with Parsons in 1946 as petroleum engineer. Former connections include Gulf Oil Corp.

Why are Frank . . .

Mike . . .

and Charlie working on this Alberta rig? If this experiment works . . .

Eskimos may man Far North rigs

ESKIMOS may become the tool pushers, the drilling foremen, the crew members of the rigs which will tap the oil and gas resources of the Far North.

With an eye cocked to the vast potential which the North holds, one Calgary-based drilling company has launched a training program to prepare for the future.

Already hard at work on a rig of Peter Bawden Drilling, Ltd., in the Swan Hills oil field 150 miles north of Edmonton, are three Eskimos from Inuvik on the Mackenzie River delta. They are Charlie Thrasher, 27, Mike Selamio, 21, and Frank Joe Esagok, 19.

"They've been on the job since June 2," explains Peter Bawden and his general manager, Bob Sparrow. "If they keep the pace they're going, there's no doubt the experiment will be a success."

The way they see it, there is no doubt that the next major field for oil and gas conquest lies in the frozen wastes of the Far North. It is reasonable that men from warmer climates, even the best, might balk at spending long periods of time in wildernesses. But for the Eskimos, it's a natural habitat.

So the company is starting now to build up a bank of manpower to take over in the North when the time comes for expansion in those areas.

"We aren't out of the woods with these three boys yet," Bob Sparrow hastens to explain. "They may not stick out the 2 or 3 years of learning that will qualify them as first-class hands. At the end of that time, they might qualify as drilling foremen. With 4 or 5 years behind them, it is not unlikely they might become tool pushers.

"They must adapt mentally, physically, and socially to our climate and conditions to complete their training. They might get fed up and head back to Inuvik and the fishing and trapping that has been their occupation until now," says Sparrow.

"But I have every confidence in them. They are fine boys, mechanically inclined—they worked for a time on DEW-line operations—and wanted to continue in this line of work when their DEW-line jobs expired."

The drilling company does not expect miracles. Their plan is strictly of a long-range nature. It will take time—possibly years—to realize the major advantages of the program. But it is expected that 4 months will prove the plan to a degree. If in that time Charlie, Mike, and Frank prove themselves, the company proposes to bring more Eskimos down and put them into the program.

Should they fail to carry through—unlikely at present—three others will be brought down and the program will start all over again. Bob Sparrow says that the immediate objective is to get together one full Eskimo drilling crew of 18 men.

So far the language barrier has made little difference to the three Eskimos. They understand English very well and speak it quite fluently. It was feared originally there might be some resentment on the part of other members of the crew with which they work, but there has been none. They fitted in very well.

"They're clever; you tell them something once and they don't forget it," says Pat O'Connor, supervisor of the rig they are working on. When they first came down, they were kept in Edmonton for a few days to study drilling equipment and assembly processes. They were just like farm boys in the city for the first time—the big buildings amazed them."

Peter Bawden's plan had its birth during a trip he and Sparrow took to the Arctic in 1957. They traveled by motor boat from Hay River down the Mackenzie to Aklavik, and then flew in to Whitefish station, a whaling point. There they spent 10 days living with the Eskimos. They were impressed by their sincerity, diligence, and conscientiousness.

Physically, Eskimos are generally fairly slight of build, short, and wiry. "We don't need mooses of men in our business," said Bob Sparrow. "A wiry, muscular fellow with lots of stamina is the type we need."

A few months ago, Peter Bawden made his proposal to the Department of Northern Affairs. Officials there jumped at it and got in touch with their vocational guidance men in the North. These three men were picked to test the plan. They were flown to Edmonton by the department as a part of the department's northern aid program.

This latest move is another in a series which has seen the Bawden company grow from a one-rig operation in 1952 to the second largest in Canada in 1959. Seven years ago, Peter Bawden started with one drilling rig. By 1958 he had built his string to six and bought out the seven rigs of Husky Oil & Refining, Ltd., making his total 13. Then, a few months ago, he bought out Trident Drilling Co., Ltd., and its 11 rigs. Since then he has bought another. So now with 25 rigs in the field he is the second biggest drilling operator in Canada. Commonwealth Drilling Co., Ltd., Calgary, with 27 rigs is the largest Canadian contractor.

Australian test due Wreck Island

Mines Administration Pty., Ltd., Brisbane, has contracted to drill a well on Wreck Island for Humber Barrier Reef Oils, Ltd., of Canada. The island is 275 miles off the northeast coast from Gladstone.

Contractor has moved a National T-32 rig from Papua which was loaded on the landing craft "Wewak" at Hisiu Beach. From there it was shipped to Wilson Island. Initial plans were to unload the rig at Wreck Island, but due to bad weather, high seas, and fear of negotiating the reef surrounding Wreck Island, Wilson Island, which is 3 miles northwest of Wreck Island, was chosen as an intermediate shipping point. Again hampered by weather, only 150 tons of the 220-ton shipment was unloaded at Wilson Island. It was necessary to transfer the remaining cargo for unloading at Gladstone. Transfer of the rig equipment from Wilson Island to Wreck Island was carried out using the landing craft "Tamona" which was on loan from the Papual Apinaipi Petroleum Co., Ltd.

The craft's design allowed it to navigate the reef. The Tamino will be used to maintain communications to service the venture with scheduled runs between Gladstone and Wreck Island.

Dr. Nauss, managing director of Humber, will personally supervise the drilling operation.

New Alaskan contractor gets wildcat job

A second Bakersfield, Calif., drilling contractor was getting ready to enter the drilling picture in Alaska. Clyde Hall Drilling Co. was readying a new National 110 rig for shipment to Cape Yakataga where it will drill a wildcat for Richfield Oil Corp. Coastal Drilling Co., also of Bakersfield, is still the leading contractor in the new forty-ninth state with three rigs operating there.

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May 4, 1959

Wilson Mfg. Co., Inc.
P.O. Box #1031
Wichita Falls, Texas

Dear Sir:

About one year ago we purchased one of your Wilson Giant Slush Pumps for use on our Rig #1. We thought that you might be interested to know that we are very pleased with its performance.

Although you rate this pump at 95 S.P.M. Max., we have been successful in running it at 100 S.P.M. and better. Even at these speeds we find that this Giant Pump runs smooth and quiet, with no fluid pound or surge.

At the present time we are drilling in the Bisti Field, near Farmington, New Mexico, and are using 6¼" liners to app. 3000' and then change to 5½" liners to total depth of app. 6000'. We run this pump normally at 100 S.P.M. and maintain 1050# to 1150# at our pump gauge.

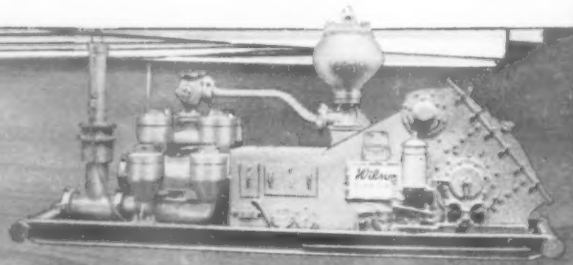
Yours truly

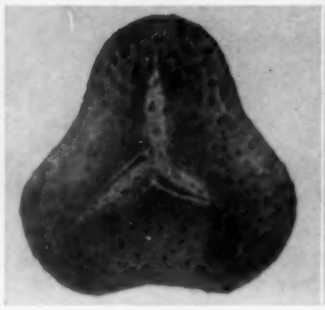
Tom Cotton

Tom Cotton

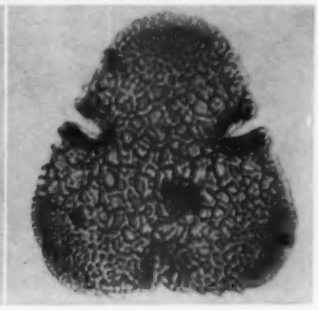
Wilson

WILSON MANUFACTURING COMPANY, WICHITA FALLS, TEXAS

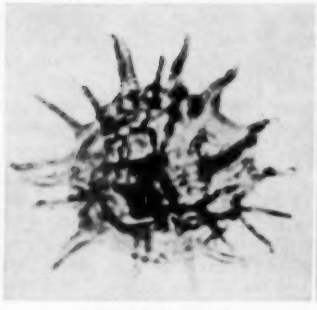




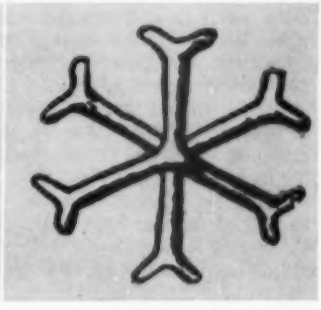
Spore



Angiosperm pollen



Hystrichospherid



Discoasterid

A SCIENTIST pokes around in the dust of centuries to squeeze from plant and animal fossils, some of them 500 million years old, the answers which he hopes will help today's experts find oil. Head of Jersey Standard's palynology group is Dr. William S. Hoffmeister, left, in charge of the palynology section at the Jersey Production Research Co. laboratory in Tulsa. Shown at right are some of the polospores he sees in his microscope.

Palynology added to oil finder's tool chest

. . . It's the study of spores and pollen

BY FRANK J. GARDNER

IN RESEARCH LABORATORIES scattered all over the world, geologists are learning that when reading the book of rocks it pays to read the small type, too.

And small it is. For the bits of matter they've been studying are so tiny that 10 of them could fit on the tip of a human hair. These are spores and pollen, the principal objects of study in the relatively new science of palynology. Some researchers have adopted the word "polospores" as an all-inclusive term for the minute objects.

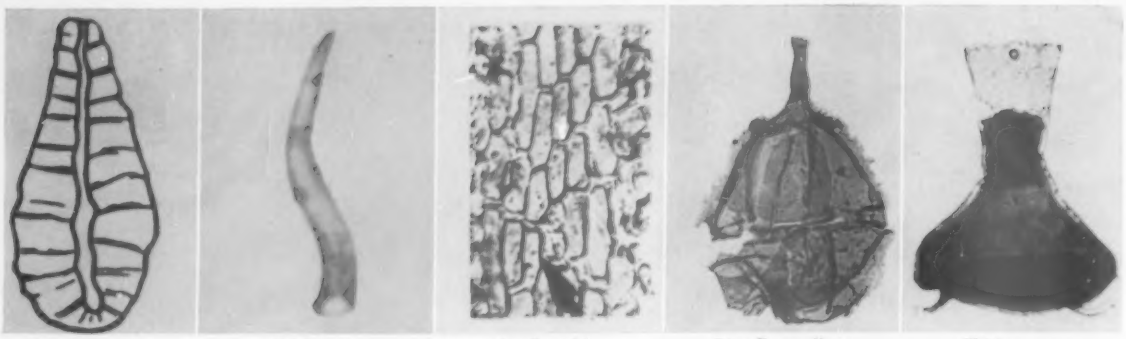
Fossil dwarfs . . . Polospores average about 1/500 in. in diameter. Magnified 1,000 times they exhibit a variety of weird shapes. Some are triangular. Some are covered with spines. Some even resemble drilling bits or cucumbers. They all have one thing in common—they are highly resistant to destruction.

Actually, palynology is a third phase in the development of paleontology. There was a day when geologists confined their studies to macrofossils (those that can be examined with the naked eye). Later they discovered the presence of microfossils in sediments. These were studied with a simple stereoscopic microscope and proved to be as valuable for correlation purposes as the larger fossils.

In the last 10 or 15 years, these geoscientists have realized that the micro-microfossils can be as valuable in the study of ancient sedimentation as their larger brothers, even though they can only be seen through a compound biological microscope.

Ride the wind . . . The name palynology is coined from the Greek verb palyno, meaning "to spread out," "to scatter," or "to distribute." And it's an appropriate name, for polospore samples have been collected on icecaps hundreds of miles from vegetation, from airplanes high in the sky, across oceans, and from almost every spot on earth.

Next to being widely traveled, perhaps the most interesting and scientifically important feature of these



Nannoconid | Trichome | Leaf cuticle | Dinoflaggellate | Chitinozoan

HERE ARE MORE examples of the polospores that are proving so helpful in geologic correlation work today.

little objects is their indestructibility. In the laboratory, the research geologist can literally dissolve a chunk of rock using the most powerful solvents he knows without affecting the skeletal structure of the polospore at all. Oxidation is the only known process that can destroy them.

Palynology is a relatively new branch of science and only since World War II has it come into the oil-finding picture at all. But its successful application in only the past 10 years has launched a widespread program of research by oil companies all over the world.

Geologists have discovered that the study of polospores can enable them to correlate strata, to delineate ancient shore lines, and to reach some understanding of primitive climates and environments. Such knowledge is extremely valuable in outlining favorable areas for possible oil accumulation and exploration. Another advantage claimed for palynology is that the polospores can be found in a much greater percentage of clastic rocks than can foraminifera or macrofossils.

Pollen analysis, an earlier term for palynology, was first recognized as a science in 1916 when the Scandinavian countries employed it in a study of peat bottoms. The Germans and Swiss also did some early work on correlation by pollen analysis. But they confined their studies largely to the younger formations in the geologic column.

Spores and pollen have long been studied in coals and peats, mostly for vegetational and climatic interpretation, and for the correlation and recognition of coal seams. But it was not until 1944 that Dr. L. R. Wilson, a specialist in the subject, called attention to the commercial application of the science for oil finding purposes.

In 1946 Wilson was hired by the research department of a major oil company as a consultant. He was put to work studying the polospores and other minute microfossils from two wells. The object was to determine if the sediments of the two wells, located about 15 miles apart, could be correlated solely by means of palynology. The results showed they could.

The science had been applied successfully in a laboratory in Colombia as early as 1945, and it was discovered that the studies applied to older rocks as well as the younger ones. Soon after this, two major oil companies established palynological laboratories in Venezuela.

Into the laboratory . . . Interest in the new approach has since grown rapidly. By 1950 it was becoming generally known throughout the oil industry, but only a few companies had laboratories. One reason? The supply of personnel trained in the science was extremely limited. Some companies hired paleobotanists who had trained themselves in palynology. Others used micropaleontologists who, with the help of competent palynologists, were converted to polospore specialists.

Since 1955 a lot of progress has been made, and many labs have been set up. Today at least 15 major oil companies are pursuing palynology studies. These include the Standard of New Jersey and Socony Mobil families, Sun Oil Co., Shell Oil Co., Richfield Oil Corp., Pan American Petroleum Corp., Sinclair Oil Corp., Gulf Oil Corp., and Union Oil Co. of California.

The Jersey Standard group alone has installed 10 new field labs within the last 6 years. Two are being installed in Billings, Mont., and in the Maracaibo area of Venezuela. Older installations are located at Bogota, Colombia; Palembang, Sumatra; Calcutta, India; Houston; Tripoli, Libya; Calgary; Ankara, Turkey; and Karachi, Pakistan. The Jersey Production Research Co. laboratory, in Tulsa, serves as a clearing house for materials from these areas.

As early as 1938, the Royal Dutch-Shell Group contracted two botany professors to examine samples from Mexico, the Far East, and the Caribbean in order to evaluate the potential of palynology for stratigraphic studies. The results were so favorable that after World War II a full-scale program was undertaken in Venezuela. Today Shell has such labs all over the world. Carter Oil Co. started the first palynology program in the U. S. in 1946 and was followed in quick succession by the other majors.

Obviously the field is growing rapidly. In 1954 only 61 polospore specialists were occupied in these studies; only five were employed full time by oil companies. Today there are more than 90 at work, 31 of them full-time, for oil companies in North America. The figures may be incomplete, but they do reflect the trend upward. Similar increases are believed to be occurring in other parts of the world. Companies that cannot afford or do not need full-time palynologists can now send their samples to consulting labs, of which there are now two in the U. S.

And help to discover oil . . . Why is this new science so important to oil?

. . . Polospores are found in practically every sediment, even in salt, and generally are well preserved.

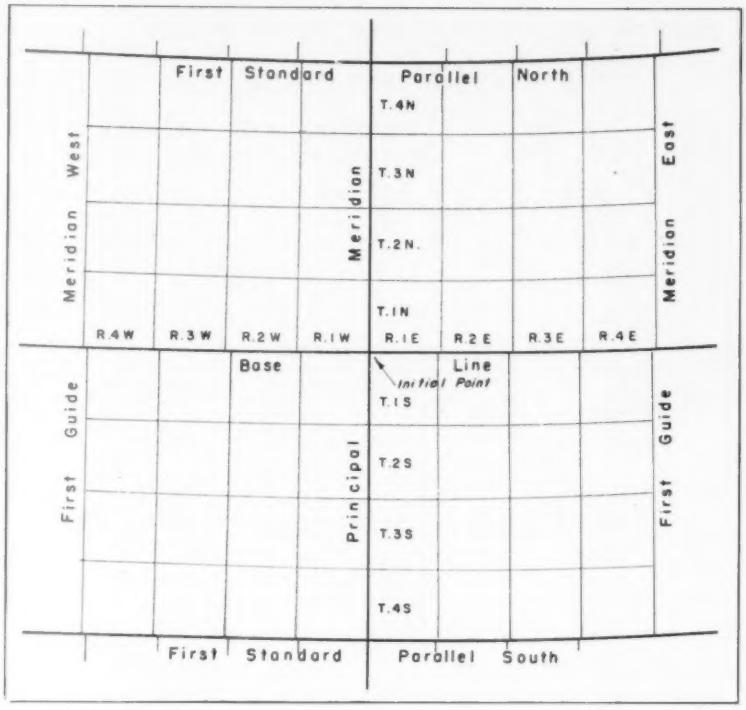
. . . They are so small the drilling bit cannot destroy them.

. . . They are found in practically all environments.

. . . They are useful for quick dating of sediments and for correlation and zonation.

. . . They can be used to outline ancient shore lines, a favorable environment for the accumulation of oil.

Pollen and spores, then, previously considered only as villains by hayfever sufferers, are fast emerging as heroes in the search for oil and gas. You can expect to hear a great deal more about them in the future.



Using as a guide this typical chart of component units and subdivisions of a rectangular system, the author tells how to . . .

Clear away range-township fog

By CLYDE C. MATHEY
Economics Department
Sinclair Oil & Gas Co.
Tulsa

IT IS HOPED this article will clear away any fog shrouding the methods of land survey.

The United States uses a system of survey known as rectangular. This method was passed as an ordinance by the Continental Congress in 1785. It is a system which is expandable and although employing certain set rules it is flexible. Because of these advantages it has formed the framework for land-survey divisions for the United States and has since been adapted by our neighbor, Canada. While both countries use the same basic system there are still differences which can be clarified.

Meridians

The system of land-survey divisions is based on measurements from a chosen principal meridian and a chosen standard parallel of latitude. The states which employ the rectangular system of survey are laid off in quadrangles, essentially 6 miles square, known as townships. Each township is subdivided into 36 sections the sides of which are termed section lines. Townships in the United States are numbered beginning at the intersection of the base line and the principle meridian and going east, west and north and south. It is customary to designate these divisions Range East and West, and Township North and South. Although townships are essentially 6 miles square and subdivided into 36 sections there are exceptions to this; fractional townships occur in some states. This occurs when a township is without a full linear south or east boundary because of the presence of a large body of water, an impassable object, a state or reservational or grant boundary, or for other similar reasons. (For a more complete discussion of fractional townships and sections contact the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., which has for sale to the public "Manual of Instructions for the Survey of The Public Lands,"[1] wall map of the United States, scale 37 miles to 1 in., and separate maps of the Public Land States, scale 12 miles to 1 in., showing the developed rectangular surveys.)

The 13 original states, Texas, and part of Louisiana along the Mississippi River do not use the rectangular system. The surveying practices that prevailed in those regions were comprised of land grants and were and are defined by irregular metes-and-bounds, each depending more or less on the description of adjoining tract, known by name or survey number, and mostly without common geographic location other than by reference to some well-known natural object.

Four steps comprise the procedure for the establishment of the rectangular system in the United States:

1. The establishment of independent initial points, each to serve as an origin for surveys to be extended in separate localities.

2. The survey of principal meridians and base lines, originating at the initial points.

3. The establishment of guide meridians initiated at the base lines, and of standard parallels initiated at principal meridians, at intervals sufficiently near each other to maintain a practical workable adherence to the legal definition of the primary unit—the township 6 miles square.

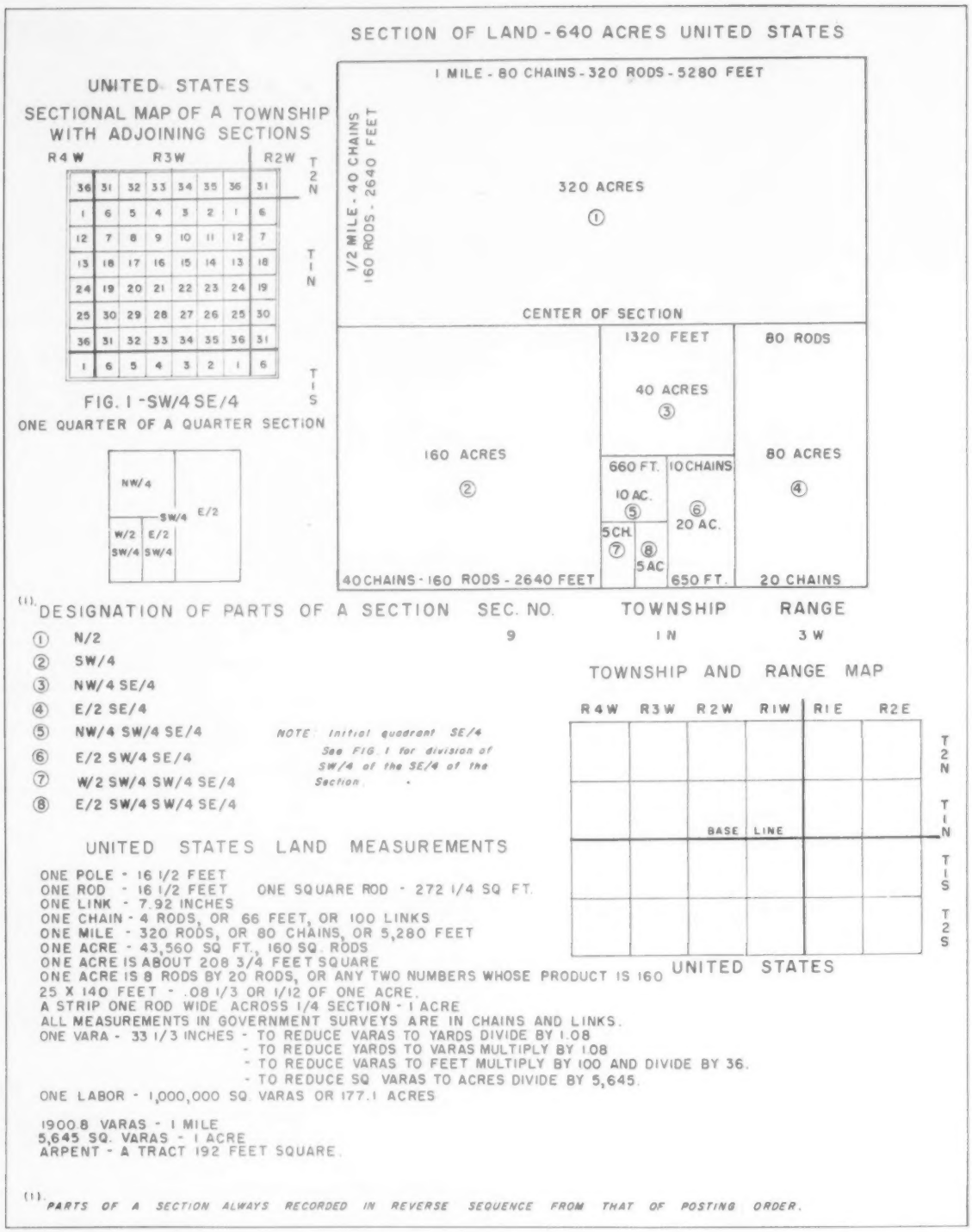
4. The subdivision of the township from south to north and from east to west a distance of 1 mile.

In the United States the establishment of initial points, principal meridians and base lines from which the lines of the rectangular surveys are extended have been developed over a period of 150 years.

Canada

In Canada townships are not designated north and south. The intersection of a base line and meridian do not exist except at the parallel of latitude of 49° which is the boundary line of the United States and Canada. From this line of latitude all townships number to the uppermost boundary of Canada.

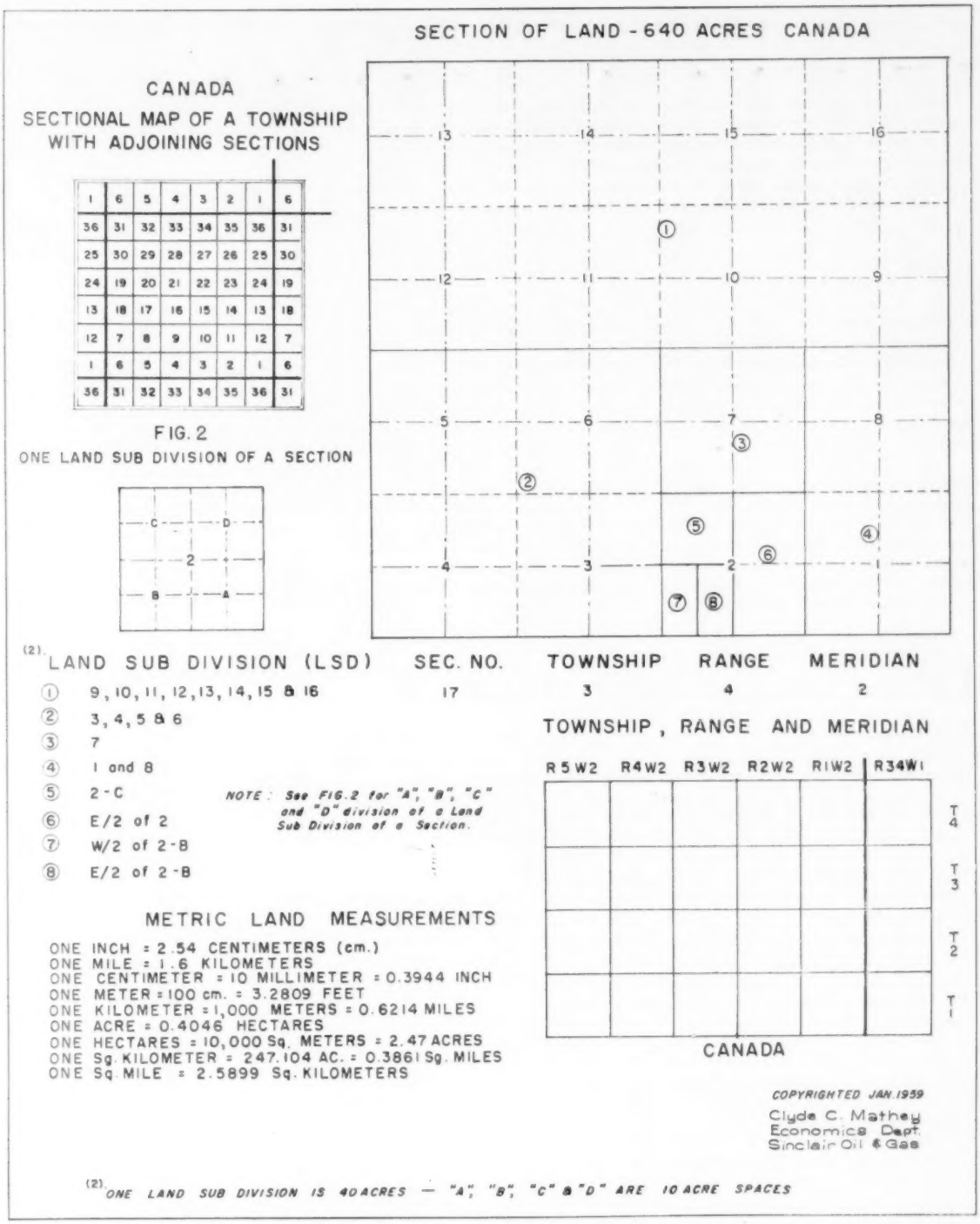
[1] Public Land States refer to the states which have been added after the original 13.


SECTION OF LAND - 640 ACRES UNITED STATES
UNITED STATES
SECTIONAL MAP OF A TOWNSHIP WITH ADJOINING SECTIONS
R4W R3W R2W
T 2 N
T 1 N
T 1 S
FIG. 1 - SW/4 SE/4
ONE QUARTER OF A QUARTER SECTION
NW/4
SW/4
E/2
W/2 SW/4
E/2 SW/4
1 MILE - 80 CHAINS - 320 RODS - 5280 FEET
1/2 MILE - 40 CHAINS
160 RODS - 2640 FEET
320 ACRES
①
CENTER OF SECTION
1320 FEET
80 RODS
40 ACRES
③
160 ACRES
②
80 ACRES
④
660 FT.
10 AC.
⑤
10 CHAINS
⑥
20 AC.
5 CH.
⑦
⑧
5 AC
40 CHAINS - 160 RODS - 2640 FEET
650 FT.
20 CHAINS
(1) DESIGNATION OF PARTS OF A SECTION
① N/2
② SW/4
③ NW/4 SE/4
④ E/2 SE/4
⑤ NW/4 SW/4 SE/4
⑥ E/2 SW/4 SE/4
⑦ W/2 SW/4 SW/4 SE/4
⑧ E/2 SW/4 SW/4 SE/4
NOTE: Initial quadrant SE/4
See FIG. 1 for division of SW/4 of the SE/4 of the Section.
SEC. NO. 9
TOWNSHIP 1 N
RANGE 3 W
TOWNSHIP AND RANGE MAP
R4W R3W R2W R1W R1E R2E
T 2 N
T 1 N
T 1 S
T 2 S
BASE LINE
UNITED STATES
UNITED STATES LAND MEASUREMENTS
ONE POLE - 16 1/2 FEET
ONE ROD - 16 1/2 FEET
ONE SQUARE ROD - 272 1/4 SQ FT.
ONE LINK - 7.92 INCHES
ONE CHAIN - 4 RODS, OR 66 FEET, OR 100 LINKS
ONE MILE - 320 RODS, OR 80 CHAINS, OR 5,280 FEET
ONE ACRE - 43,560 SQ FT., 160 SQ. RODS
ONE ACRE IS ABOUT 208 3/4 FEET SQUARE
ONE ACRE IS 8 RODS BY 20 RODS, OR ANY TWO NUMBERS WHOSE PRODUCT IS 160
25 X 140 FEET - .08 1/3 OR 1/12 OF ONE ACRE.
A STRIP ONE ROD WIDE ACROSS 1/4 SECTION - 1 ACRE
ALL MEASUREMENTS IN GOVERNMENT SURVEYS ARE IN CHAINS AND LINKS.
ONE VARA - 33 1/3 INCHES - TO REDUCE VARAS TO YARDS DIVIDE BY 1.08
- TO REDUCE YARDS TO VARAS MULTIPLY BY 1.08
- TO REDUCE VARAS TO FEET MULTIPLY BY 100 AND DIVIDE BY 36.
- TO REDUCE SQ VARAS TO ACRES DIVIDE BY 5,645.
ONE LABOR - 1,000,000 SQ. VARAS OR 177.1 ACRES
1900.8 VARAS - 1 MILE
5,645 SQ. VARAS - 1 ACRE
ARPENT - A TRACT 192 FEET SQUARE.
(1) PARTS OF A SECTION ALWAYS RECORDED IN REVERSE SEQUENCE FROM THAT OF POSTING ORDER.

LAND SURVEY DIVISIONS of the United States show the typical breakdown of a standard section.

Ranges in Canada, except at the principal meridian, are all denoted as west ranges. This is because all the meridian lines in Canada are west of the principal meridian. There are seven meridians in Canada. From the principal meridian west all of these meridians are 4° apart and are located on standard degree meridian lines, 102° to 122°, respectively. These meridians, of course, refer to the reference meridian regulating the rectangular survey system in Canada.

The principal meridian is located between 97° and 98° meridian, in the province of Manitoba. This is the only province in Canada employing the rectangular survey system that has ranges denoted as east and west, the ranges in the other provinces are all west ranges. All of Manitoba,


SECTION OF LAND - 640 ACRES CANADA
CANADA
SECTIONAL MAP OF A TOWNSHIP WITH ADJOINING SECTIONS
FIG. 2
ONE LAND SUB DIVISION OF A SECTION
(2) LAND SUB DIVISION (LSD)
SEC. NO.
TOWNSHIP
RANGE
MERIDIAN
① 9, 10, 11, 12, 13, 14, 15 & 16
② 3, 4, 5 & 6
③ 7
④ 1 and 8
⑤ 2-C
⑥ E/2 of 2
⑦ W/2 of 2-B
⑧ E/2 of 2-B
17
3
4
2
NOTE: See FIG. 2 for "A", "B", "C" and "D" division of a Land Sub Division of a Section.
TOWNSHIP, RANGE AND MERIDIAN
R5W2 R4W2 R3W2 R2W2 R1W2 R34W1
T 4
T 3
T 2
T 1
CANADA
METRIC LAND MEASUREMENTS
ONE INCH = 2.54 CENTIMETERS (cm.)
ONE MILE = 1.6 KILOMETERS
ONE CENTIMETER = 10 MILLIMETER = 0.3944 INCH
ONE METER = 100 cm. = 3.2809 FEET
ONE KILOMETER = 1,000 METERS = 0.6214 MILES
ONE ACRE = 0.4046 HECTARES
ONE HECTARES = 10,000 Sq. METERS = 2.47 ACRES
ONE Sq. KILOMETER = 247.104 AC. = 0.3861 Sq. MILES
ONE Sq. MILE = 2.5899 Sq. KILOMETERS
COPYRIGHTED JAN. 1959
Clyde C. Mathey
Economics Dept.
Sinclair Oil & Gas
(2) ONE LAND SUB DIVISION IS 40 ACRES — "A", "B", "C" & "D" ARE 10 ACRE SPACES

CANADIAN land survey divisions illustrate the standard section of land and its elements.

Saskatchewan, Alberta and part of British Columbia use the rectangular survey system.

B. C. . . . Most of the surveyed area of British Columbia uses the lot system. However, the township system (rectangular survey system) is established in part of northeastern British Columbia, in part of the Vancouver-Chilliwack area, and in some valleys of the interior.

A large part of northeastern British Columbia is still unsurveyed. For this reason a permit and lease "grid system" has been set up under the British Columbia "Petroleum and Natural Gas Act, 1954."

This system employs an index map showing areas in which map sheets exist numbered 82, 83, 84, 92, 93, 94, 103 and 104—seven in all—each of these is divided into 16 areas; then each area is further subdivided into

twelve zones, noted A, B, C, D, E, F, G, H, I, J, K, and L. Each of these is further divided into 100 units known as centizones.

Because of the large area involved regions using the rectangular system and developed rectangular-survey system map for Canada necessitates a wall-size map. (Contact the Petroleum and Natural Gas Department, The Canadian Bank of Commerce, Calgary, Alta., Canada).

While the chart in this article shows a normal township which includes 36 sections, partial townships also exist in Canada.

Perhaps here it should be mentioned that in a normal township, because of the northward convergence of meridians, townships are not always exactly 6 miles across, nor are sections always one mile wide.

There is often a slight offset where they meet along the range line to compensate for this convergence. All excesses and deficiencies due to the convergence of meridians are placed in the northern and western quarter-section of the township. Therefore normal townships will include 36 sections in all, 25 of which contain 640 acres each; 10 sections (on the north and west boundaries) each contain regular parts totaling 480 acres with 4 additional fractional lots in each section, each lot containing 40 acres plus or minus, these amounts determined by the survey; and, section 6 containing regular parts totaling 360 acres with 7 additional fractional lots each containing 40 acres, plus or minus, certain definite differences to be determined by the survey.

In the United States section 1 appears in the upper right hand corner, reading from right to left, the second line beginning with section 7 in the left hand corner and so on alternating each row ending with section 36 in the lower right hand corner. The same is true in Canada, only in reverse with section No. 1 in the lower right hand corner and section 36 in the upper right hand corner.

The phase of this chart devoted to the designation of parts of a section is supplemented with two figures. Fig. 1 is the representation of one quarter of a quarter-section in the U. S. which is, of course, 1/16 of a section. Fig. 2 is the equivalent of a quarter quarter-section and is referred to as a LSD (Land Sub Division), of which there are 16 in Canada.

In the United States the initial quadrant of a section is always the last portion mentioned in a description. In other words, parts of a section are always recorded in reverse sequence from that of the posting order. U. S. descriptions of a section are more complicated than those in Canada. An example of this: Item No. 8 in the chart, Fig. 2 United States designation of parts of a section reads E/2 SW/4 SW/4 SE/4. The same description in Canada reads simply: E/2 of 2B. While our descriptions are longer they require only the knowledge of the method of their recording sequence. In Canada the numbering system of a section forms the architecture for the designation of the parts of a section. The numbering system of quarter quarter-sections in Canada is then the control for Canada's system of section breakdown. This then is the main reason and purpose for the design of chart.

Lake Erie gas hunt steps up

FURTHER extension of the onshore gas field to a point 1¾ miles south into Lake Erie has been made by Place Gas & Oil Co., Ltd., in the drilling of its Place 7 Walpole, the second consecutive commercial gasser drilled this season on the company's 80-square-mile block of offshore acreage in the Selkirk area of eastern Lake Erie, Ontario.

Located ½ mile south of the Place 3 Walpole producer, which came in earlier this month with a natural flow of 1 M.M.c.f.d. from the Red Medina formation, the Place 7 Walpole blew in, registering a natural open gas flow of 800 M.c.f.d. from the same pay formation. Upon completion of the new well, the company will move its new floating-type platform "Mr. Cliff" to a further ½ mile stepout location to the south for the drilling of Place 8 Walpole.

● In the Port Dover area, the company's Place 5 Dover well, drilled 2 miles offshore south of Port Dover, has been successfully fractured, increasing the open flow of the well from its original 450 M.c.f.d. rating to a flow of 1,280 M.c.f.d. Preparations for the drilling of the Place 6 Dover offset are under way. Place Gas & Oil now has a total of eight commercial gas wells in the eastern sector of the lake. The stepout procedure of drilling this season in both the Selkirk and Port Dover areas has established numerous offset drilling locations.

● In the western end of the lake on a 9,400-acre offshore block offsetting the Imperial-Harvest-Submarine oil discovery in Colchester Township South, the Place 1 Colchester, located 350 ft. offshore and about ¾ mile west of the discovery well, is drilling at an approximate depth of 860 ft. Objective is the Trenton formation at a depth of approximately 2,100-2,200 ft.

Two floating platforms of the "Mr. Cliff" type ordered earlier this month are scheduled for delivery by mid July, at which time the company expects to have six or more drilling rigs in operation on its various acreage blocks.

Pennsylvania's Somerset reports new find

In Pennsylvania, a new discovery is reported on the Seven Springs anticline in Somerset County. Location is in Seven Springs field.

The well was drilled by Peoples Natural Gas Co. on the Department of Forests and Waters Tract 75 in Jefferson Township. This new producer is located on a separate fault block than the Blair pool well which opened this field last year. Tract 75 well is producing from the Onondaga chert found at 8,456 ft. Gas was found at 8,472-74 ft. Initial production was 10,933 M.c.f.d. with rock pressure of 3,350 psi. in 24 hours. Total depth is 8,474 ft.

● On the west side of Rockton field in Clearfield County, Lee Minter et al. 1 Green Glen was completed in Oriskany sand for an estimated open flow of 45 M.M.c.f.d. with rock pressure of 3,900 psi. in 24 hours.

Montana extension to Richey pool announced

In Montana Ambassador Oil Corp., and Texota Oil Co., have announced the completion of an important extension to Richey pool, McCone County.

The 1 Schrock is located in 26-27n-49e. The well flowed 1,060 bbl. of 38°-gravity oil in 24 hours on initial potential test. The flow was through a 28/64-in. choke from open hole at 7,045-70 ft. in the Charles D-3 zone after treatment with 500 gal. of mud acid. Shut-in tubing pressure was 1,175 psi.

The well has two pay zones, the B-1 and B-2, behind the pipe. The two zones were drill-stem-tested from 6,890-6,940 ft. and 4,500 ft. of free oil was recovered. A southwest diagonal offset, the 2 Schrock, is now drilling under surface pipe.

—Photo courtesy Cities Service Co.

Texas calls to wildcatters

WIDESPREAD EXPLORATION in Texas puts this state of many basins, producing areas, and still-untouched wildcat frontiers in the forefront of summer wildcatting. Important discoveries, significant wildcat campaigns in oil-barren counties, and extensions of existing trends dot the big state from the Rio Grande to Amarillo. Big areas to watch in the coming weeks are the deeper portions of the secretive Delaware basin, the upper reaches of the Rio Grande embayment, the Sheffield channel, the far south's King Ranch country, the northwestern Anadarko basin in the Panhandle, the Port Arthur-Galveston area in the southeast corner, and the near-dry Palo Duro basin.

Delaware basin's deep oil hopes

. . . are on the upswing as a result of Magnolia Petroleum Co.'s deep oil-discovery prospect in western Pecos County. The 1 Kathleen J. Moore had heavy oil flows in the Wolfcamp Permian, reviving the deep-drilling lag in the big basin. When Magnolia got to 10,890 ft., drilling with gas in place of mud, the well started heading oil. Drilling-gas pressure was shut off and operators started backing out of the hole with drill pipe. The well unloaded about 200 bbl. of oil in 15 minutes.

This important Delaware basin test is 30 miles northwest of Fort Stockton in the southeastern corner of this elusive oil bowl. It is in an area that has had only scattered testing, mostly medium-depth wells under 10,000 ft. Despite previous poor performance by the Wolfcamp in the basin, the 1 Moore should stimulate another look at deep drilling in the Delaware. A basin with many shallow successes in recent months, the Delaware's deep drilling tapered off to almost nothing last year. Magnolia's success should change all this.

Rio Grande exploration

. . . is being watched closely by Texans this year. Two deep wildcats are probing the unknowns of the Val Verde basin in Val Verde County. One, a Humble Oil & Refining Co. wildcat, is on the Pandale anticline. Objective is the Ellenburger below 15,000 ft.; the other is a Shell Oil Co. wildcat in the north-central part of the county, also a deep one—to 17,000 ft. These wells will tell much as drilling progresses in an area of little production but much promise. If either of the wells hits, expect a spirited drive into this remote area of Texas.

. . . pays off handsomely in southeastern Zapata and across northern Webb counties. A brisk Wilcox development is moving this prolific trend farther southwest with good gas and condensate reserves being tapped. This drilling spree in these far southwestern counties is a further extension of the Wilcox trend that has been under way for the past several years.

The Sheffield channel

. . . beckons those who drill to ultradeep depths. Important wells are drilling below 14,000 ft. Some of the half dozen wildcats going are going below 17,000 ft. for a look at one of Texas' last wildcat frontiers. Stirred by the success of Brown-Bassett field in Terrell County, these bold oil hunters should give us a clue soon to the potential of this all-but-unknown channel that connects the Delaware and Val Verde basins. Its true extent and worth are cloudy, but current exploration may shove away this veil.

Palo Duro records

. . . will gain much-needed geologic information this summer. More wells have been drilled in this one-field basin (Texas side) during the first 6 months of 1959 than in any other comparable period. No one has found anything yet, but wildcats scattered from the west to east ends of the basin and along the Matador uplift, its southern boundary, will give us a better picture of what we might find here in subsequent drilling. Most of the wildcats drilled this year went to at least 8,000 ft. Half a dozen are going now. The results will be noted with keen interest.

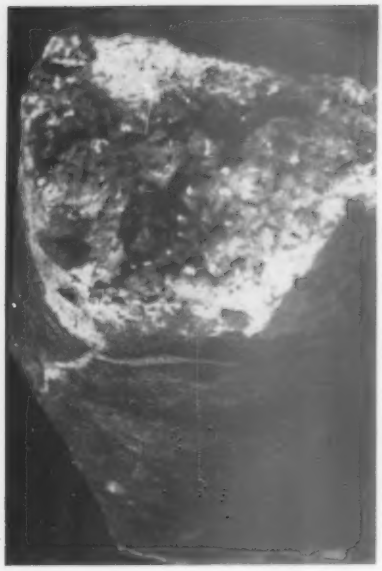
The Texas Panhandle attack

. . . centers in Ochiltree and Lipscomb counties in the northwestern extremes of the Anadarko basin. Ten strikes in less than a month with but one dry hole keep drillers busy in Ochiltree County. The entire northern part of Lipscomb County is undergoing close scrutiny this summer with new producing areas being opened in previously dry sections. The target in this sector is the Pennsylvanian.

Rich gas-condensate reserves

. . . unfold with ease in Southeast Texas as the Galveston and Port Arthur areas are fast becoming one huge reservoir. Jefferson and Galveston counties lead the program.

—John C. McCaslin.



PULASKI. Fig. 1.

ALBION. Fig. 2.

SCIPIO. Fig. 3.

These pays encourage new drilling as . . .

Michigan drillers exploit Ordovician reservoirs

FAVORABLE developments in the Trenton-Black River formation of the Ordovician system created considerable interest and activity in the oil industry during 1958.

This interest was confined principally to Branch, Calhoun, Jackson, and Hillsdale counties. Activity ranged from intensive leasing programs to development in the Scipio field which was discovered in 1957.

A total of 19 new wells were completed, making 25 producible wells at the end of 1958. These wells produced 527,253 bbl. of oil during 1958 for an accumulative total of 613,484 bbl. Production is from a secondary dolomite and is confined to a fracture zone. Presently, the field is about ½ mile wide and 2 miles long, trending south-southeast to north-northwest. Structurally, the fracture zone is directly associated with a shallow syncline which plunges to the north-northwest. All of the production has been in or on the flanks of the depression. Approximately 30 ft. of relief is indicated. The northwest and southeast limits of the field have not been established. The Trenton-Black River is principally limestone with very little porosity outside the fracture zone.

From "1958 Summary of Operations, Oil and Gas Fields," published by Geological Survey Division, State of Michigan.

Another Trenton-Black River discovery was drilled in the area in December 1958. This test was located in Section 22, Albion Township, Calhoun County. It is significant that the well is aligned with the general Scipio trend although located some 12 miles away in a northwesterly direction. The structure and general characteristics of Albion field are similar to those in Scipio field.

Based on the lineation and position of the two fields, a successful test was completed between these fields in early 1959. This test, the Turner Petroleum Corp., Blair No. 1 in the SE NW SW 20-4s-3w, Pulaski Township, Jackson County, has all the general characteristics of the earlier two fields. The nature and position of the three fields suggest the possibility of a fracture zone at least 20 miles in length which has been partially proven productive of oil. Future prospects along this trend are very encouraging.

The producing pays in the Scipio, Pulaski, and Albion trend are illustrated (Figs. 1, 2, 3, and 4). All of the photographs are of representative samples from 4-in. cores. A small section of a core from the Northville Field in northeastern Washtenaw County is included for comparison. The vugs in the cores vary considerably in size and shape, depending on the degree of fracturing and resulting solution activity. The pays are irregular as can be expected in reservoirs of this type. Some of the fractured and brecciated zones have been completely resealed with white crystalline dolomite.

NORTHVILLE. Fig. 4.

The reservoir energy is furnished principally by a large gas cap with some indications of a bottom-hole water drive. The wells are prorated at 150 bbl. of oil per day but not allowed to produce in excess of 200 M.c.f.d. of gas. Present spacing is 1 well to 20 acres with the wells located in the center of the northwest and center of the southeast 10 acres of each 40-acre tract.

Exploration for the type of fracture-zone trend discussed above is costly and hazardous. The low differ-

ences in relief are not readily indicated by regional contours. In other Trenton producing areas of the state, such as the Deerfield, Northville, and Freedom fields, the fracture zones have been located along the flanks of good vertical structures with reliefs of several hundred feet in less than one-quarter mile. These structures are prominant northwesterly trending features which are indicated with a minimum amount of well control.

A major portion of the exploratory and development activity during 1959 will be concentrated on the Trenton-Black River sediments in southern Michigan. The results of this work will have a direct bearing on the future of the oil industry in Michigan.

Michigan basin gets two tests

BOTH ENDS of the Michigan basin figured highly in exploratory news. On the north side, Leonard Oil Co., Inc. 1 Laaraman, NE NE SW 19-21n-7w, Missaukee County, made 105 bbl. of oil per day on a 3-day test after treatment of Dundee pay at 3,971-74 ft. This wildcat discovery is the first important hit in northern Michigan in 2 years. Gulf Oil Corp. has two offsets planned.

In southern Michigan, A. E. Rovsek 1 Braddock, SE NW SW 25-3s-3w, Jackson County wildcat off the Albion-Scipio Trenton trend play, gaged 19 M.c.f.d. on drill-stem test at 2,334-40 ft. in the A-2 Salina section.

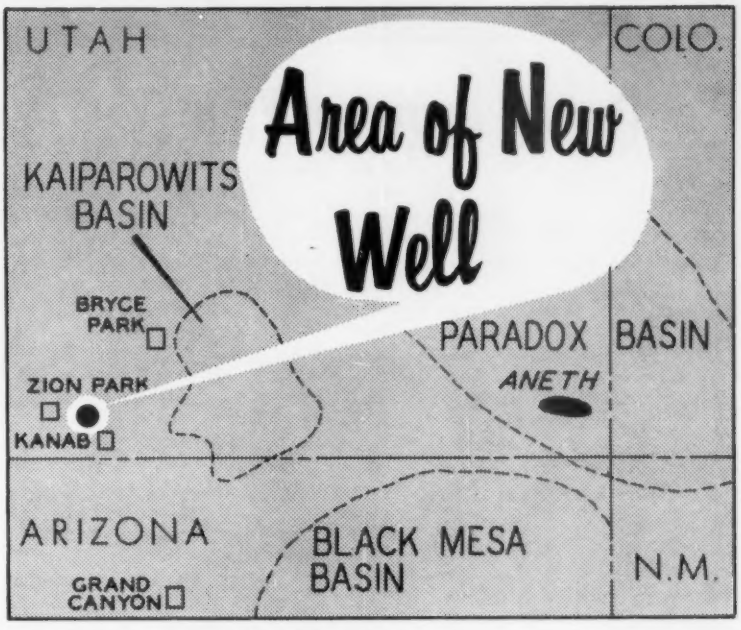
Oklahoma's Dewey adds fourth producer

Dewey County in western Oklahoma, an area with only three producing areas, apparently has a good producer in line at Sinclair Oil & Gas Co.'s 1 Collier in West Valley Center field.

The well, located in C NE NE 15-17n-18w, has found production in both Oswego and Tonkawa, Mississippian and Pennsylvanian, respectively. This southwest extension well got 9,977 M.c.f.d. on test of the Oswego at 9,174-98 ft.; Tonkawa at 7,527-37 and 7,543-60 ft. got 1,020 M.c.f.d.

Mexican border test spudded

A WILDCAT has been spudded in on a location about 3½ miles north of the Mexican border in the Yuha basin of Imperial County. The operator, De Anza Oil Co. Ltd., indicated it would be a shallow test, about 1,000 ft. expected to tell the story.



Near Utah's most forbidding basin . . .

Kaiparowits drilling begins

PREDICTED EXPLORATION in Utah's Kaiparowits basin is about to begin. J. Ray McDermott & Co. of Houston will drill on the western side of this forbidding basin at 1 State in SW SW 2-43s-8w, Kane County.

This is McDermott's third wildcat in this general area. About 5 years ago the company put two wells down in Kane County. One was the 1 Government-Strat in C SE NW 19-42s-7w. It went to 3,652 ft. in the Permian Kaibab with no shows. The same year the 2 Government in 17-42s-7w went to 3,712 ft. in the Kaibab.

This wildcat is in one of the most remote exploratory areas of the western United States. There is no current production in the basin. Location is about 12 miles northwest of the town of Kanab and 7 miles north of the Arizona line. Most previous drilling in the county has been 40 miles east. Virgin field, an old timer, lies 22 miles northwest in Washington County. This now defunct field produced from Moenkopi Jurrassic.

McDermott's new try will go to at least 11,000 ft. and through the Cambrian. The Pennsylvanian and Mississippian section will get a close look. There has been scattered reports of oil and gas shows in shallow drilling to the south in Mohave County, Arizona.

Regional scene . . . The Kaiparowits basin is a small basinal area in the central part of Kane and Garfield counties. It is separated from the big Paradox basin to the east by the Circle Cliffs upwarp. Heylmun states that the basin is contiguous with Arizona's Black Mesa basin to the southeast. The two basins appear to be quite alike in many respects. The only dividing line between them is the Grand Canyon of the Colorado River.

History . . . The search for oil in Kaiparowits is not new. It began in 1921 at an Ohio Oil Co. wildcat on the Circle Cliffs upwarp itself. Several other wildcats were drilled in following years by other companies. None had success.

The basin's hopes . . . The Pennsylvanian limestones and sandstones in the basin are very similar to those in Utah's Paradox basin, according to Heylmun.

Much is left to be done in this basin—mostly drilling. There has been considerable leasing throughout the region. Last year's activity in Mohave County, Arizona, stirred new interest in the area. The basin has the necessary tools to be an oil producer—necessary stratigraphy and structure within logical drilling depths. The new wildcat in Kane County could well be one of the most important tests of the year in the southwestern mountain and canyon-desert province.

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The Dowell engineer will want to take into consideration as many of these factors as possible:

- Depth, thickness, permeability and porosity of producing zone
- Viscosity, gravity and compressibility of reservoir fluid
- Reservoir pressure and bottom-hole temperature
- Previous treatment data — pressures, injection rates and materials.

Then, using the charts and formulas in his manual, he can predict — with reasonable accuracy — the effect of these variables:

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- Type of fracturing fluid
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From these calculations he can engineer the most economical treatment — to help you get the results you want at the greatest net profit to you.

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Since he can determine the fluid loss of various fracturing fluids, he can select the lowest cost fluid to give the desired fracture area.

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Since he can predict injection rates and pressures, he can use high sand concentrations with less danger of unplanned sandouts. This helps keep down both fluid and pumping costs.

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First, they used it to predict treatment results on hundreds of wells. Then, they compared these predicted results with known results of frac jobs already made on the wells. *They discovered that predictions made with the "Frac Guide" closely corresponded with what actually did happen.* More important, they also found many instances where they could have engineered a far more profitable treatment if the "Frac Guide" had been available.

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Here are examples of the type of results that are being

In the Texas and Oklahoma Panhandles —

—16 treatments were engineered with the "Frac Guide." These treatments produced production increases that averaged 63 per cent better than those obtained by previous treatments on similar wells. In many wells, treatment costs with the "Frac Guide" averaged 20 to 30 per cent less than costs on previous treatments. The improved production increases meant faster payouts and more profitable wells.

In the Denver Julesburg Basin —

—treatments engineered with the "Frac Guide" have been used in both the "D" and "J" sands. Generally, payout time on these jobs has been about half that of previous treatments because the desired amount of sand can be put away with less refined oil. For example, two treatments into the "J" sand were compared. Payout time for the job using the "Frac Guide" was only 100 days as compared to 186 days for the other job. In another study of two treatments, the cost of the job using the "Frac Guide" was about $2000 less, and payout time was more than 50 per cent less.

In Northern Oklahoma —

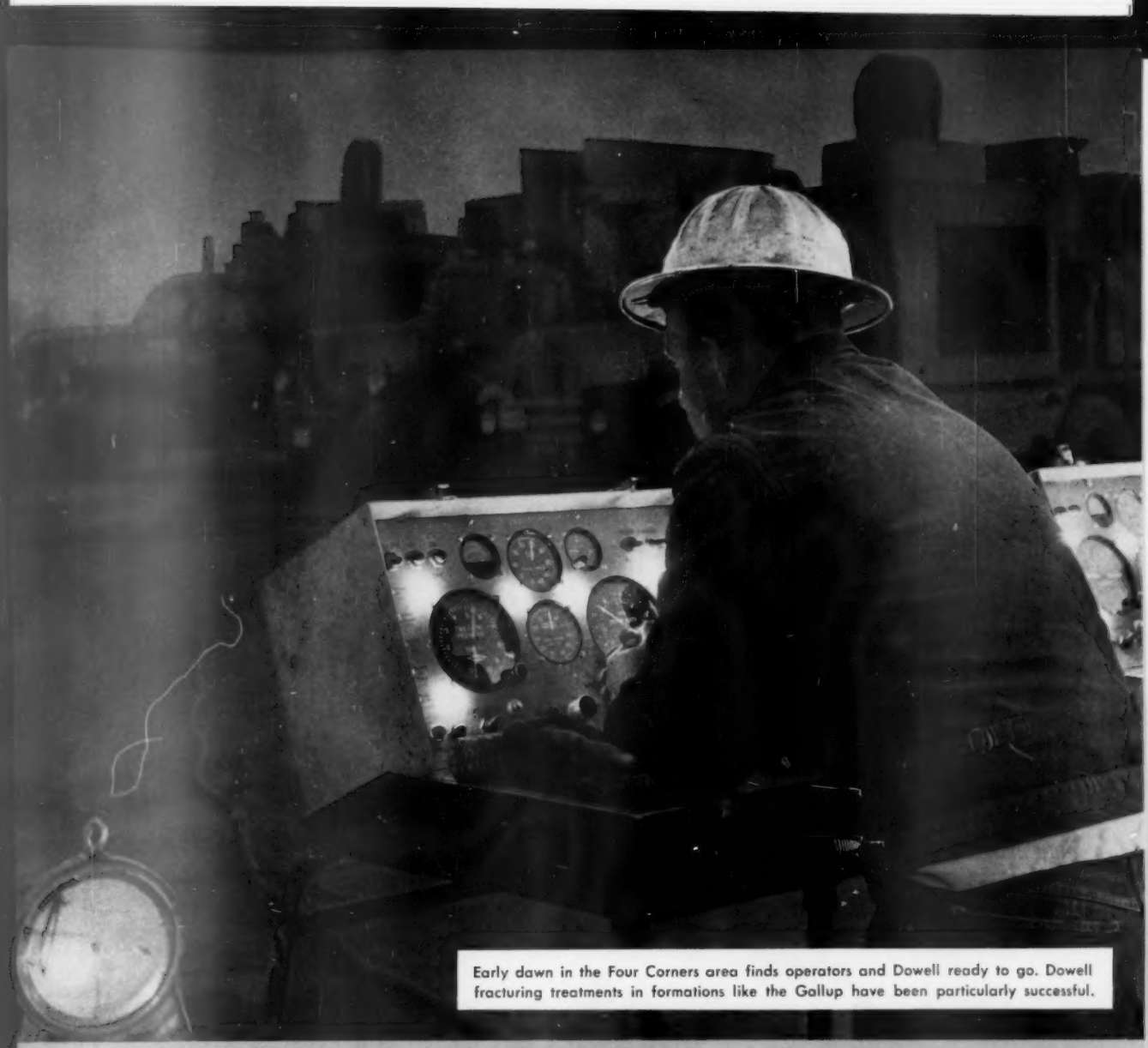
—40 wells treated with the "Frac Guide" were compared with other fractured wells. The jobs using the "Frac Guide" cost about 15 per cent more but allowed the use of 50 per cent more sand. Initial potentials of the wells treated with the "Frac Guide" were higher, and decline curves are expected to be flatter.

In Southern Oklahoma —

—the "Frac Guide" has permitted the use of water-base fluids instead of more expensive fracturing fluids. Many wells have been treated with four-cent-per-gallon fluids instead of the 10-cent-per-gallon fluids previously used. Many excellent producers have resulted.

In Lea County, New Mexico —

—Lea County wells treated with and without the "Frac Guide" were compared. The wells for which treatments were engineered with the "Frac Guide" averaged 295 bopd flowing, while other fractured wells averaged less than 70 bopd pumping.



Early dawn in the Four Corners area finds operators and Dowell ready to go. Dowell fracturing treatments in formations like the Gallup have been particularly successful.

obtained with the help of "Frac Guide" developed by Dowell

In Crane County, West Texas —

—wells completed in the San Andres have shown much slower decline rates after treatments with the "Frac Guide," even though there were no significant increases in potential.

In Ector County, West Texas —

—a comparison of wells in the Edwards pool was made. Treatments engineered with the "Frac Guide" gave production increases about 40 per cent greater than other treatments in the same field.

In the East Texas-Northern Louisiana area —

—comparisons were made on a control group of eight wells—four wells were treated with the "Frac Guide," and four without. All wells were completed into the Mooringsport formation and were generally similar. Treatment costs for the wells fractured without the "Frac Guide" averaged $4440; and average production test figures rose from 6.5 to 55.5 bopd. When the "Frac Guide" was used, treatment costs dropped to an average of $2904. Average production test figures rose from 8 to 121 bopd. In this case, an average of $1536 was saved per treatment, and results were greatly improved.

In Uintah County, Utah —

—a well was producing 10 bopd and failed to respond to a fracturing treatment. Another similar well was treated with the aid of the "Frac Guide." This well was also producing 10 bopd before treatment. After fracturing, production shot up to 220 bopd; and the well was still producing 185 bopd—steady—60 days later.

In Converse County, Wyoming —

—two treatments made with the "Frac Guide" were compared with other frac jobs made on the same lease. Previously, rapid production declines to 12 or 15 bopd had made frequent re-treatments necessary. All wells in the field had been pumping. Though the jobs with "Frac Guide" cost about twice as much, production stabilized at about 56 bopd *flowing*, lifting costs were reduced and payout was faster.

New oil pool for Kentucky

First reports of the new oil pool in Metcalfe County, South Central Kentucky, are in.

Associated Drilling Corp. just completed the 1 Otis Grissom Tract "B," 2½ miles southeast of the town of Edmonton. It pumped and flowed 2,060 bbl. of oil the first 2 days from 36 ft. of Warsaw of lower Mississippian age.

This is the fourth well on the Grissom lease. The other three have a combined output of 800 bbl. per day. They are 1,200-ft. stepouts from the new Warsaw pool. There are 15 producers in this new field which lies in the county south of the big booming area in Green County. Total depth of the Associated well is 292 ft.

Two finds revive Texas' Dimmit County interest

Two new oil discoveries are reviving interest in northwestern Dimmit County, Southwest Texas.

One is by Gulf Oil Corp. in its 1 Bowman, a rank wildcat 5 miles east of Carrizo Springs. It is productive from Austin Chalk, perforated at 5,804-22 ft. and 5,980-90 ft.

The other is by Shamrock Oil & Gas Corp. at its 1-B Blanche Eubank, which opens a new Olmos-sand reservoir in the Rocky Creek area, 12 miles northwest of Carrizo Springs. Its pay is perforated at 2,330-40 ft.

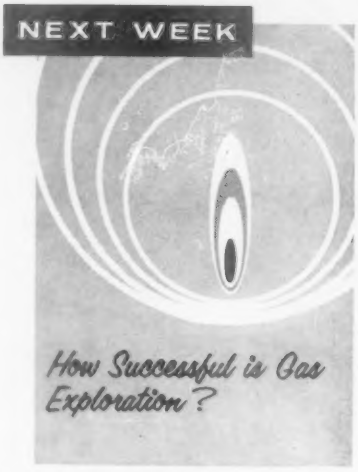
Gulf's well flowed at the rate of 140 bbl. of 34.4°-gravity oil per day through 14/64-in. choke with pressure of 620 psi. and gas-oil ratio of 1,571 cu. ft. per bbl. The well had been drilled to 8,667 ft. as an Edwards test.

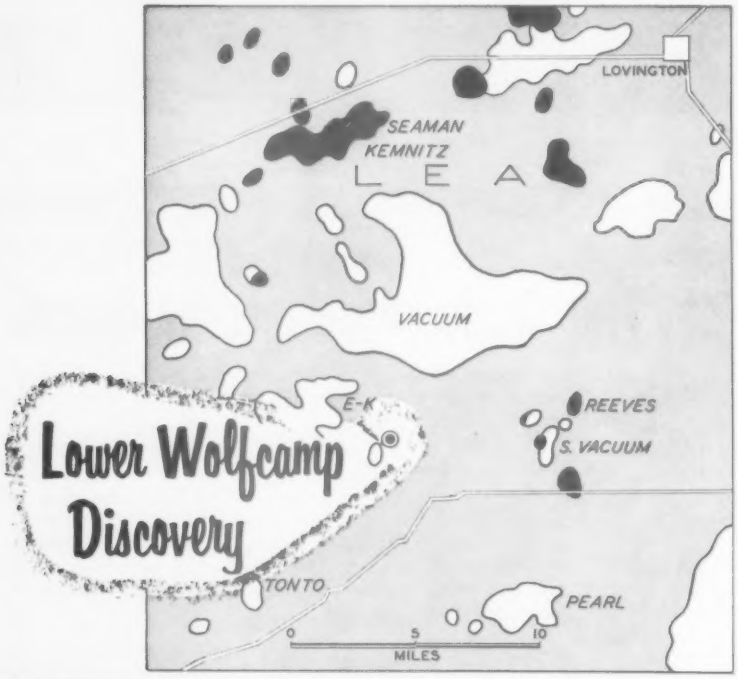
Shamrock's well is good for 220 bbl. of 39°-gravity oil per day, flowing through 16/64-in. choke. Flowing pressure is 230 psi., and gas-oil ratio 320 cu. ft. per bbl.

Significant well is tested in Nebraska

AN IMPORTANT offset well in western Nebraska's new Reiher field pumped 258 bbl. of oil per day on completion. It is Skelly Oil Co.'s 1 Adams in C SE SE 21-1n-32w, Hitchcock County. Production is from Lansing-Kansas City Pennsylvanian perforations at 3,648 to 3,906 ft. This is the first and north offset to the discovery well which pumped 348 bbl. per day.

The Reiher field discovery is considered to be the most significant Nebraska strike in many years—for two reasons. It is the biggest potential yet recorded east of the Denver basin in the state, and it is another big link in the growing Las Animas-Cambridge arch country play that is overshadowing other Mid-Continent province developments.





COMPLETION GAGE reported on Lea County discovery. Continental Oil Co. 1 Tonto Deep Unit, 22-18s-34e, was barren in the Devonian to 14,925 ft., but found a thick Lower Permian section. On final tests through Wolfcamp perforations at 11,394-11,423 ft. the well flowed 121 bbl. of 44° oil a day through ¾-in. choke. A drill-stem test of the Middle Wolfcamp at 10,631-59 ft. flowed 33 bbl. of oil in 85 minutes. On the map, shaded areas are Permo-Pennsylvanian or deeper pays.

Alberta's Foothills gets new find

THE FOOTHILLS BELT of Alberta is back on the exploratory scene with a Luscar Cretaceous gas discovery reported at Lovett River. This new gas pool is on LSD 10, 2-47-19w5. It is British American et al. 10-2-47-19 Lovett River, 140 miles southwest of Edmonton, 55 miles west of Pembina, and 3 miles northwest of Mississippian gas production at Lovett River.

A drill-stem test in the Luscar at 10,000 ft. got 1,620 M.c.f.d. Drilling has since resumed and the hole is below 10,800 ft. Objective is the Mississippian at 13,600 ft.

This Lovett River test is being drilled by the Central Foothills Agreement Group which is comprised of British American, Triad Oil Co., Royalite Oil Co., and Sun Oil Co. That group was formed to explore about 1,300,000 acres of petroleum and gas reservations along the Rocky Mountain Front in western Alberta.

Big Ohio gasser

OHIO'S largest gasser of the year, an eastward extension of Mt. Perry pool, was announced as completed by the operators, Hoosier Drilling Co.

Their 2 Robert McCloud, Section 4, Madison Township, Perry County, logged the Clinton at 3,214-46 ft. and gaged 340 M.c.f. natural and 10,450 M.c.f. 5 days after fracture with an estimated rock pressure of 800 psi.

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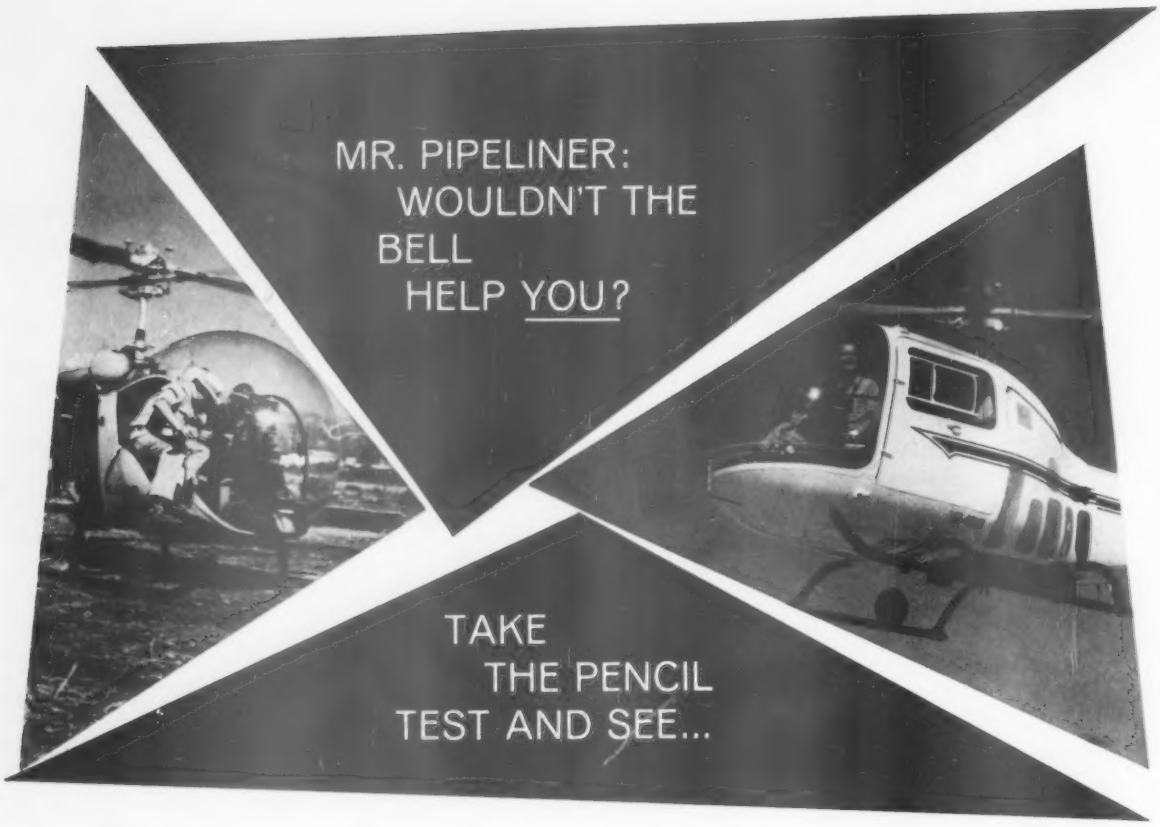

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EVER WONDER ??

GEOQUESTION . . .

Is it Bents Fort field, or Bent's Fort?

GEOANSWER . . .

This southeastern Colorado gas field shows up differently on every map. We'll take Bent's Fort. Why? The Carter Oil Co.'s LINK, May-June issue, has a very interesting history of Colorado in it. Title is "Colorado Centennial." From a cutline in the photo we found "Most famous fort of the buffalo hide days was William Bent's fort on the Arkansas River between La Junta and Las Animas." There you have it. The county is also called Bent.

Discovery wells

CANADA

Alberta: Imperial 8-12-64-11 Louise Creek, LSD 8, 12-64-11w5. Beaverhill Lake discovery. TD 8,840 ft.

Tyee-CPOG 11-16-21-18 Bassano, LSD 11, 16-21-18w4. Gas discovery. TD 4,000 ft.

ILLINOIS

Christian County: Schaefer Oil Co. 1 Padgett, NE NW NE 7-14n-2w. IPP 185 BOPD, trace water, Silurian 1,893-1,906 ft. TD 1,906 ft. New pool.

Clark County: Gillespie Oil Co. 1 Poorman, NW SW NE 17-11n-14w. IPP 28 BOPD, after river fract, Trenton 2,308 ft. TD 2,438 ft.

INDIANA

Gibson County: Hal S. Lobree 1 Messersmith-Harbison-Ross Unit, SE NW SE 7-2s-9w. IPP 27 BOPD, Helderberg 1,320-36 ft. TD 1,336 ft.

KANSAS

Barton County: Nadel & Gussman 1 Eveleigh "A," NE NE SW 1-18s-13w. IPP 360 BOPD, Arbuckle 3,329-41 ft., 39.8°. TD 3,341 ft. Eveleigh field discovery on Central Kansas uplift.

Riley County: Cities Service Oil Co. 1 Yaege, NE SW SE 25-11s-8e. IPP 36 BOPD, Hunton lime 1,684-96 ft., 33.9°. TD 1,696 ft. Opens Yaege pool on Nemaha granite ridge. Rank wildcat discovery. First producer in county.

Stafford County: Lauck-Sunray Mid-Continent Oil Co. 1 Frack, SW SW SW 27-25s-15w. IP 8,000 M.c.f.d., Cherokee Pennsylvanian 4,254-68 ft. TD 4,603 ft. Gas discovery of Southwest Haynes field in South Central Kansas basin.

SOUTH LOUISIANA

St. Mary Parish: Sunray Mid-Continent Oil Co. 1 State 3132, Township 17s-8e, East Cote Blanche Bay. IP 268 BOPD, 640 M.c.f.d., 10/64-in., 58.4°, TP 2,400 psi., perf. 15,040-54 ft. TD 15,241 ft. Second well and new pay in East Lake Sand field.

Terrebonne Parish: Union Oil Co. of California 2-S L. L. & E., 36-19s-14e. IP 2,042 M.c.f.d., dry gas, 12/64-in., TP 3,350 psi., perf. 11,084-94 ft. TD 12,954 ft. New pay in Pagie Lake field.

MONTANA

Musselshell County: Atlantic Refining Co. 1 Ralph Harvey, SE NE 7-8n-30e. IPP 33 BOPD, Amsden discovery, new field. TD 7,549 ft. Charles.

NEBRASKA

Cheyenne County: Wytex Oil Co. et al. 1 Hendricks, C SE NW 10-12n-52w. IPP 150 BOPD, 15% water, "D" sand discovery, new field. TD 5,303 ft. "J" sand.

NORTHWEST NEW MEXICO

San Juan County: Gulf Oil Corp. 2 Amarillo-Navajo, C NE NE 22-28n-14w. IPP 32½ BOPD, Gallup discovery, new field. TD 5,904 ft. Morrison.

WEST CENTRAL TEXAS

Parker County: Toto Gas Co. 1 Gibson, R. W. Johnson Sur., A-756, 5 miles southeast of Springtown. IP 600 M.c.f., Atoka sand 3,880-3,930 ft. TD 5,438 ft. Recompletion.

Stonewall County: W. T. Waggoner estate 1 Swenson Ranch, Sec. 123, BBB&C Sur., 7½ miles northeast of Hamlin. IP 150 BOPD, 10/64-in. choke, 39°, GOR 400:1, TP 250 psi., Swastika sand 3,202-14 ft. TD 3,214 ft.

WEST TEXAS

Crane County: Southland Royalty Co. 1-30 Southland "Q," Sec. 30, Blk. 1, H&TC Sur., 4 miles northwest of Imperial. IP 105 BOPD, 12/64-in. choke, 32°, GOR 216:1, CP 125 psi., Queen sand 2,140-48, 2,152-68 ft. TD 2,245 ft. Elevation 2,408 ft. New pay in Atapco-Devonian field.

Crockett County: Phillips Petroleum Co. 1 University Lands "L," Sec. 10, Blk. 20, USL Sur., 25 miles west of Ozona. IP 1,780 M.c.f. of gas, Devonian 7,045-47, 7,052-70 ft. Old TD 8,626 ft., PB 7,263 ft. Recompletion.

Culberson County: J. S. Reaves et al. 1 Prewit, Sec. 36, Blk. 59, T1, T&P Sur., 9 miles northwest of Orla. IPP 70 BOPD, 35°, GOR 675:1, Delaware 2,436 ft. TD 2,562 ft.

Gaines County: Grover, Maccurdy & Knox 1-A McDonald, Sec. 128, Blk. G, WTRR Sur., 3 miles north of Wescott field. IPP 115 BOPD, 34°, GOR 350:1, Permian 5,450-66 ft. TD 5,500 ft. Ground elevation 3,251 ft. Recompletion.

T. M. Evans 1 Maxey, Sec. 82, Blk. G, WTRR Sur., 6 miles southeast of Seagraves. IPP 10 BOPD, 34°, GOR 105:1, San Andres 5,558-5,613 ft. TD 5,757 ft., elevation 3,335 ft.

Garza County: McCrary & Franklin 2-130 McCrary "B," Sec. 130, Blk. 5, H&GN Sur., 14 miles east of Post. IPP 62 BOPD, 36°, San Andres 2,047-52, 2,058-61 ft. TD 2,690 ft. Recompletion, new pay discovery in Northwest Justiceburg field.

General American Oil Co. of Texas 1-3 Koonsman, Sec. 3, Blk. 2, T&NO Sur., 9 miles southwest of Justiceburg. IP 191 BOPD, 18/64-in. choke, 41°, GOR 205:1, TP 75 psi., Spraberry 4,916-40 ft.; IP 480 BOPD, ¼-in. choke, 41°, GOR 1,000:1, TP 600 psi., Strawn 7,683 ft. TD 8,319 ft., elevation 2,314 ft. Spraberry discovery in Red Loflin field.

Lynn County: W. B. Yarborough et al. 1-A R. L. Hagler, Sec. 1426, Blk. 18, EL&RR Sur., 7 miles southeast of Wilson. IPP 116 BOPD, 38°, GOR 236:1, San Andres 4,043-49 ft. TD 4,601 ft., ground elevation 3,009 ft. Recompletion.

Reeves County: Ray Smith Drilling Co. 1 Thompson-State, Sec. 2, Blk. 55, T-3, T&P Sur., 11 miles southeast of Orla. IPP 20 BOPD, 32°, Delaware 3,643-45 ft. TD 3,663 ft., elevation 2,832 ft.

Runnels County: Humble Oil & Refining Co. 31-LT Mrs. Lena Clayton, Sec. 1, C&M Sur., 11 miles east of Ballinger. IPP 42 BOPD, 42°, GOR 360:1, Serratt sand 2,110-18 ft.; IP 45.5 BOPD, 46°, GOR 740:1, TP 90 psi., Dogbend 3,158-72 ft. TD 4,208 ft., PB 3,208 ft., elevation 1,892 ft. Dogbend pay discovery in Hollow Creek field.

UTAH

San Juan County: Carter Oil Co. 1 Government-Fehr & Lyon, NE SE 33-40s-21e. IPP 25 BOPD and 9 bbl. salt water, Paradox discovery, new field. TD 6,283 ft.

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Robert D. Bent
. . . Atlantic's manufacturing boss.

Bent Takes Work in Stride

- **Rundown on activities of Atlantic's manufacturing boss shows he's a busy man who knows how to get things done.**

ROBERT D. BENT, new boss of Atlantic Refining Co.'s manufacturing department, is a classic example of the saying: "If you want to get something done, ask a busy man to do it."

Bent, who took over Atlantic's top manufacturing post at the age of 45, has been busy since he was a boy. And, as he grows older, he enlarges his area of activities instead of slowing down. Today, his interests are many and varied.

He was born in Philadelphia in 1914. His penchant for being busy soon became apparent. While he was attending high school, he spent his vacations working for John Wanamaker, the Philadelphia department store, and for the Breyer Ice Cream Co.

This penchant became even more pronounced while he was attending the University of Pennsylvania. While working for a chemical-engineering degree, he found time to be president of his class, become a member of Alpha Sigma Chi, honorary professional society, and Sigma Tau, honorary scholastic fraternity, and take a very active role in many other college organizations and student activities.

Bent has lived in Springfield Township, Delaware County, Pennsylvania, ever since Atlantic moved him from the company's Port Arthur, Tex., refinery to the Point Breeze refinery in Philadelphia 20 years ago.

In Springfield, he ranks as one of the community's most public-spirited citizens. He's active in church and local political affairs and has a variety of other interests.

These other interests include: Past president of the Parent-Teacher Association, chairman of the United Fund campaign, vice president of the park and recreation commission, member of the National Recreation Association, vice president and director of the Lions Club, chairman of Sea Explorer Ship 171, director of the Delaware County Community Nursing Association, and a member of the University of Pennsylvania development fund committee.

His start . . . Bob Bent went to work for Atlantic when he graduated in 1935. His first job was a process operator in the research and development department. He stayed with that department for the next 20 years, ending up as assistant director of the development division.

His first promotion came in 1936

▶▶▶ Personals

James G. Heid, Parker Petroleum Co., Ponca City, Okla., has been elected chairman of the new Northern Oklahoma section of Society of Petroleum Engineers of AIME. Other officers will be **John Whitman,** Continental Oil Co., first vice chairman; **Alva G. Comer,** Oklahoma State University, second vice chairman; and **Martin Felsenthal,** Continental, secretary-treasurer. Directors include **Henry F. Coffer,** Continental; **William J. Simpson,** Kewanee Oil Co.; and **Kenneth F. Whinery,** Phillips Petroleum Co.

K. H. Fisk, chairman of Allied Chemical Corp., will become chief executive officer when **Glen B. Miller,** president, retires September 1. In other changes, **Harry S. Ferguson,** executive vice president, will become executive committee chairman and chief administrative officer. **Chester M. Brown,** vice president, has been elected president and chief operating officer.

J. F. Dingee, Sunray Mid-Continent Oil Co. district superintendent in Oklahoma City, has been named district manager for production in the company's western Oklahoma district in Oklahoma City. Also in the western Oklahoma district, **B. A. Lovell,** formerly staff engineer in Tulsa, has been named district engineer, and **C. M. Graham,** formerly South Oklahoma area superintendent, becomes district field superintendent. **A. F. Siedel,** plant superintendent for the Oklahoma-Kansas district, has been appointed plant superintendent, western Oklahoma district. **R. B. Marton, Jr.,** has been named western district geologist. **O. H. Duncan** will be district landman. **R. J. Ford** has been named district geologist for the southern Oklahoma district, also in Oklahoma City, and **C. E. Davis** has been named southern district landman.

C. H. Augsburger, reservoir engineer, and **W. V. Rogers,** petroleum engineer with Olin Oil & Gas Corp., have been promoted to assistants to **Earl Brimberry,** manager of production and pipeline operations. Augsburger will be in charge of drilling and production operations in coastal Louisiana, Texas, and Oklahoma. Rogers will supervise drilling and production in North Louisiana and Arkansas.

when he was made a junior engineer. He took on a big job a year later when he represented the research and development department in plant engineering and start-up of operations at Atlantic's Port Arthur refinery. That took him through 1938.

In 1939 he was named assistant in charge of plant scale development and, in 1948, was placed in charge of that department. From 1951 to 1953 he traveled over a good portion of the world selling and starting up licensed operations. When he finished his travels, he was made assistant director of the development division.

Last year Bent switched over to manufacturing to set up and head the technical-service department. In February of this year he was named assistant general manager of manufacturing and, on June 11, he succeeded W. F. Stroud, who had headed Atlantic's manufacturing department since 1952.

Still busy . . . While working for Atlantic, Bent found time to attend the University of Pennsylvania's Wharton school for business training, to teach graduate work for 3 years at Drexel Institute's evening college, and to become a registered engineer in Pennsylvania.

During World War II he served with the Aviation Gasoline Advisory Committee, Military Petroleum Advisory Board and the U. S. Strategic Bombing Service. He has a "Q" clearance with the Government.

In between times he has written quite a number of technical papers and articles and has earned a number of patents. He has also found time to be active on many API committees.

David P. Carlton, retired chief geophysicist for Humble Oil & Refining Co. and now a Houston consultant, has been elected president of the Geophysical Society of Houston. He succeeds **John F. Anderson,** Anderson & Cooke. Other new officers are **Sam P. Worden,** Texas Instruments, Inc., first vice president. **Kenneth A. Webb,** Seismic Exploration, Inc., second vice president; **John L. Bible,** consultant, secretary; and **Sam M. Pena,** consultant, treasurer.

William R. Gannaway, regional geologist in Tulsa for Sun Oil Co., has been appointed assistant division chief geologist for the Mid-Continent production division. He will continue to headquarter in Tulsa. A graduate of the University of Tulsa, Gannaway joined Sun in 1948.

Walter J. Slagle, division geologist in Sunray Mid-Continent Oil Co.'s Tulsa general offices, has been named division geologist in the company's new southwest division headquarters in Midland, Tex. Others in the exploration department in Midland will include **M. P. Thomas,** division landman in Tulsa, now division landman in Midland, and **Paul J. Beaver,** formerly Midland district geologist, now division exploration geologist. **Robert Teipel,** Roswell, N. M., district geophysicist, has been named division staff geophysicist in Midland and **Thomas P. Harris, Jr.,** water flood engineer in Tulsa, will be Midland division log and reserves analyst. **Irwin A. Pierce,** formerly in Tulsa, will be division lease records supervisor. **Claude H. Burns,** Tulsa, will be chief of the contracts department for the division. In the production department, **E. J. Pierce,** formerly North and West Texas district engineer, becomes Midland division engineer. **Wayne C. Moody,** formerly mechanical engineer in Tulsa, will be purchasing coordinator in Midland. **E. J. Mills,** manager of plant operations in Tulsa, will be division gas coordinator. **G. E. McClatchey,** development superintendent in Midland, has been named division drilling coordinator there. **V. M. Williams,** formerly in Tulsa, will be Midland division joint operations coordinator. **J. G. Burgess,** Tulsa, has moved to Midland as division office manager and will work with both the production and exploration departments.

E. R. Douglas, geologist in Atlantic Refining Co.'s Tulsa office, has been promoted to district geologist in the company's new Amarillo, Tex., office. **Ron R. Grost,** geologist, also will move to Amarillo from Tulsa.

John W. Miller, general manager and a director of International Refineries, Inc., Wrenshall, Minn., has been appointed vice president. He succeeds the late L. G. Alexander. Miller will continue as general manager of the company. He was export sales manager for Creole Petroleum Corp. in New York before joining International last year.

G. R. Belt, division geophysical interpretation supervisor for Gulf Oil Corp. in Fort Worth, has been named district geophysicist in charge of the Midland, Tex., district's new geophysical department.

▶ ▶ ▶ Personals

S. V. McCollum, production manager for the CATC group of companies, has resigned to join Tennessee Gas & Oil Co. as manager of offshore operations. He will headquarter in Lafayette, La. **R. L. Adams,** production superintendent of Continental's Roswell, N. M., division, has been

McCOLLUM

ADAMS

promoted to manager of production for the CATC marine region, succeeding McCollum. Continental is operator of the CATC group which also includes Atlantic Refining Co., Tidewater Oil Co., and Cities Service Production Co. Adams will headquarter in Houston. McCollum had been with Conoco since 1939. He was assistant production manager for the southwestern region in Fort Worth before assignment to CATC. Adams joined Continental in 1946. He was assistant division superintendent in Midland, Tex., before moving to Roswell in 1955.

Jack Reed, formerly West Texas division geologist for Pan American Petroleum Corp., has joined Diversa, Inc., Dallas, as district geologist in the new Midland, Tex., office. **Ralph Storm** has been appointed West Texas district manager with headquarters in Dallas. **Douglas D. Howard,** formerly regional geologist with Creole Petroleum Corp., has been named district geologist for the Tennessee-Kentucky area with headquarters in the new Oneida, Tenn., office. Also **Roy D. Garner,** formerly with Rimrock Tidelands Drilling Co., has been named South Louisiana district manager in New Orleans. **Frank G. Spain** becomes district land man in New Orleans.

John W. Cooke, Jr., formerly in Continental Oil Co.'s foreign department geological section, has joined Texas National Petroleum Co. as chief geologist.

T. A. Riggs, formerly supervising engineer with Standard Oil Co. of Texas in Houston, has joined California Research Corp. as supervisor of the oil recovery research division at the company's La Habra, Calif., laboratory.

WATSON JONES WARREN HILL MITCHELL FRAME

Cities Service Names Watson Chairman, Warren President

IN A MAJOR realignment of Cities Service Co.'s top management, Burl S. Watson, president, has been elected chairman of the board and chief executive officer.

He succeeds W. Alton Jones, chairman and chief executive since 1953. Jones becomes chairman of the executive committee.

J. Ed Warren, former senior vice president of First National City Bank of New York, will succeed Watson as president of the company. Warren joined Cities Service last November as chairman of the executive committee and a director.

Three senior vice presidents have been elected. They are A. P. Frame, Charles S. Mitchell, and George H. Hill, Jr.

Erle G. Christian, formerly secretary, and Edward L. Stauffacher, formerly president of Cities Service Oil Co. (Pa.), a subsidiary, are newly elected vice presidents. Frank K. Foster, manager of domestic accounting, succeeds Christian as secretary.

Watson has been president of Cities Service since 1953 when he succeeded Jones in that position. He joined the company in 1917.

Warren, new president, was an independent producer before joining First National City Bank of New York. He was deputy administrator of the Petroleum Administration for Defense in 1952 and 1953 and is a member of the National Petroleum Council.

J. R. Barsalou has been named operations manager at Humble Oil & Refining Co.'s Baytown, Tex., refinery. **Ike D. Hall,** chemical-products coordinator in Humble's Houston office and former assistant head of the technical division at Baytown, has been appointed administrative manager at the refinery. Barsalou is a former technical assistant to the manager of manufacturing in Humble's Houston office. He also has been assistant head of coordination division and general foreman of light-oil treating at Baytown.

D. R. Moore has been promoted to senior chemical engineer in the technical division at Humble Oil & Refining Co.'s Baytown, Tex., refinery. **E. C. Winegartner** has been promoted to senior research chemical engineer at Baytown, and **Dr. R. T. Moravek** has been named senior research chemist.

A. R. West, vice president of Tennessee Gas & Oil Co., has been named vice president and general manager of Tennessee Argentina, S. A., subsidiary which will carry out Tennessee Gas & Oil's drilling contract in Tierra del Fuego.

E. A. Hutchinson, district geologist in Sunray Mid-Continent Oil Co.'s Tulsa general offices, has been named eastern Oklahoma district geologist. **J. P. Ling** will be district landman. Headquarters of the new district will be in Tulsa.

Gordon I. Atwater, New Orleans consultant, and **Ben H. Parker,** Frontier Refining Co., Denver, have been nominated for president of American Association of Petroleum Geologists. Election will be by mail ballot and

ATWATER

PARKER

new officers will be installed at next year's AAPG annual meeting in Atlantic City. Other nominees are, for vice president, **Frank B. Conselman,** Abilene, Tex., consultant, and **Mason L. Hill** Richfield Oil Corp.; for secretary-treasurer, **George V. Cohee,** United States Geological Survey, and **Louis H. Lukert,** Texaco, Inc.; for editor, **Grover E. Murray,** Louisiana State University.

James C. Posgate, assistant manager of Humble Oil & Refining Co.'s crude oil department, has moved up to manager. He succeeds **Donald F. Haynes,** who has retired after 40 years with the company. Haynes had been crude-oil manager since 1946. Posgate was assistant eastern division superintendent for Humble before becoming assistant crude-oil manager several months ago.

J. W. Inkster, Tulsa exploration manager for Shell Oil Co., has been transferred to Houston in the same capacity. He succeeds **M. S. Metz,** who will be on special assignment in the New York office. **R. L. Trott,** executive assistant to the vice president, Tulsa area, has been transferred to the Houston area in a similar post.

Mark E. Nider, chief communications engineer for Natural Gas Pipeline Co. of America, has been named assistant superintendent of the communications division of the company and its affiliates. A graduate of the University of Nebraska, Nider has been with Natural Gas pipeline since 1950.

George Maddox, Continental Oil Co., has been elected president of the Denver Basin Oil Scouts Association. Other officers are **James J. McGraw,** Skelly Oil Co., vice president and **Ken Horn,** The California Co., secretary-treasurer. **Robert Disch,** Carter Oil Co., and **James Cunningham,** Amerada Petroleum Corp., were elected directors.

Eric R. Denton, formerly supervisor in charge of domestic operations for Seismograph Service Corp.'s continuous velocity logging division, has resigned to join Geosurveys of Australia, Ltd. a new company. Denton, an Australian, has had assignments in the Middle East, Europe, Canada, and the U. S. with Seismograph Service.

J. H. Pittinger, area geologist for Shell Oil Co. in Tulsa, has been transferred to Houston. **C. A. Wood,** geophysicist, will move to Los Angeles from Tulsa. **D. A. Robertson,** geologist in New Orleans, has been transferred to Pittsburgh, and **W. L. Kreps,** mechanical engineer, will move to Great Bend, Kans., from Oklahoma City.

Joseph T. Froehlich, formerly superintendent of the Anacortes, Wash., refinery of Texaco, Inc., and **Roy L. Lay,** assistant to the vice president in charge of foreign operations (Eastern Hemisphere), have been appointed general managers of Texaco's foreign operations department (Eastern Hemisphere). Froehlich had been superintendent at Anacortes for the past 2 years. Lay had been assistant to the foreign operations vice president since 1956. **Harold P. Creel,** formerly assistant superintendent for maintenance and construction at Texaco's Lockport, Ill., refinery, will succeed Froehlich as superintendent at Anacortes. Creel was head of operations at Iranian Refining Co.'s Abadan refinery before being assigned to Lockport last year. **Frank Wilking,** supervisor of maintenance and construction at Lockport, will succeed Creel as assistant superintendent, maintenance and construction.

FROEHLICH

LAY

J. L. Stauss, vice president of Falcon Seaboard Drilling Co. and president of D & D Drilling & Construction Co., C. A., Venezuelan subsidiary company, has been named Mid-Continent area vice president of American Association of Oilwell Drilling Contractors. He replaces **F. G. McClintock,** who is now with First National Bank & Trust Co., Tulsa.

R. P. Moscrip, chief mechanical engineer in Shell Oil Co.'s Midland, Tex., area office, has been transferred to Shell Development Co. in Houston. He will head the mechanical engineers training section in Shell Development's exploration and production research division there. **J. E. Orrell,** Pacific Coast area chief mechanical engineer, will succeed Moscrip in Midland.

Dr. H. T. Byck, formerly assistant to the vice president of Shell Development Co., has been named manager of administration and services in the Houston exploration and production research division. Byck succeeds **Frank Goldstone,** who has been assigned to Shell Oil Co.'s exploration department. **Barclay Van Dyke,** assistant to Shell Oil's exploration and production vice president in New York, and **W. L. McKinnon,** assistant to Shell Development's administration and services manager, have been named assistant managers of administration and services for Shell Development. Van Dyke's appointment is effective in October. In other changes, **Dr. Gordon Rittenhouse,** manager of the geology department in Shell Development's basic research section, has been named consultant in geology to the laboratory staff. **Dr. D. V. Higgs,** geologist in the basic research section, becomes geology department manager succeeding Rittenhouse.

E. Charlton Crocker, director of personnel for Nalco Chemical Co., has been named manager of applied research and development in the company's laboratories at Clearing industrial district site near Chicago. **H. W. Spaght,** vice president and former head of Nalco's general chemical manufacturing division, has been named vice president in charge of personnel. **Donald G. Blake,** assistant superintendent of Plant 1 in Clearing, has been promoted to plant manager. Nalco was formerly National Aluminate Corp.

▶▶▶ Personals

Loren L. Ware, Sinclair Oil & Gas Co.'s vice president in charge of exploration, has been elected a director. Ware joined Sinclair in 1944. He was Fort Worth division exploration superintendent and Midland, Tex., assistant division manager before being named general superintendent of exploration for the company in 1957. He became a vice president last year.

Stanley C. Hope, retired president of Esso Standard Oil Co., has been elected a director of Nylok Corp., Paramus, N. J. Hope is currently president of the National Association of Manufacturers and chairman of the Automotive Safety Foundation.

Rick Merback, Mobil Producing Co., has been elected president of Wyoming Oil Scouts Association. He succeeds **Dick Lewis,** Ohio Oil Co. Other new officers are **Arthur French,** The California Co., vice president, and **Paul Ellington,** Skelly Oil Co., secretary-treasurer.

Bayard C. Low, management assistant in the Houston crude oil department of Humble Oil & Refining Co., will retire August 1. He joined Humble in 1920.

▶▶▶ Deaths

Robert Stafford Johnson, 66, retired combustion engineer for Pennzoil division of South Penn Oil Co., died June 22 in Oil City, Pa. Johnson was with Pennzoil 14 years before his retirement last year.

E. C. Harlin, 85, pioneer Texas oil producer, died June 28 in Fullerton, Calif. Harlin was a senator in the first Oklahoma legislature.

James Mason Gantt, 43, of the exploration staff of Esso Standard Oil Co., S. A., in Cuba, died June 25 in a Havana hospital. Gantt joined Carter Oil in 1945. He transferred to Havana with the Cuban affiliate company in 1957.

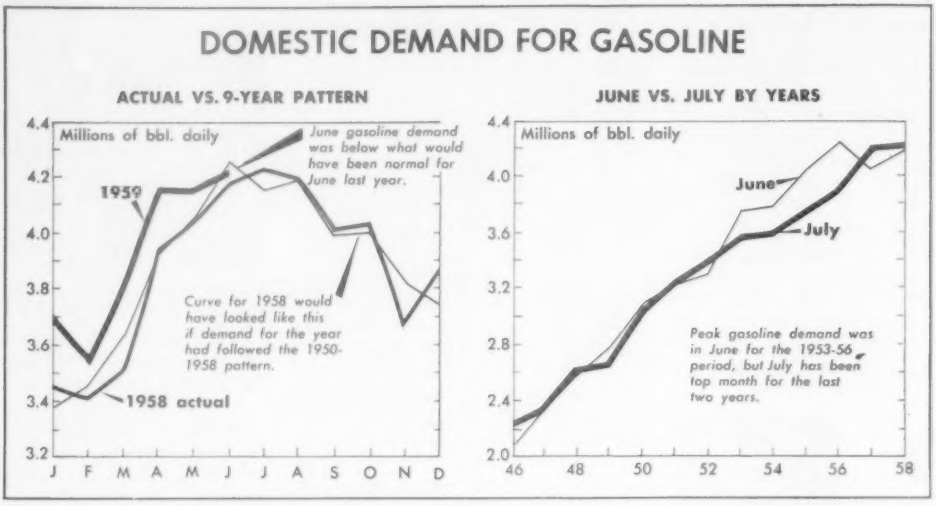
James J. Jones, 78, retired Tulsa geologist, died June 29 in a Tulsa hospital of injuries received in an automobile accident several days before.

Joseph M. Ramsey, 86, Pennsylvania independent producer, died June 24 after a long illness.

Travis Moore, 37, Oklahoma City district superintendent for British-American Oil Producing Co., died June 29 of cancer. Moore was Ardmore, Okla., district superintendent for Pan American Petroleum Corp. before joining British-American last year.

Alfred A. Hopper, 59, Jones & Laughlin Steel Corp.'s district sales manager, supply division, in Bartlesville, Okla., died July 1 in a Bartlesville hospital. Hopper was with Frick-Reid Supply Co. before it was purchased by Jones & Laughlin.

Harry C. (King) Pouder, 82, president of Pouder-Pomeroy Oil Co., died July 1 in a Tulsa hospital.


DOMESTIC DEMAND FOR GASOLINE
ACTUAL VS. 9-YEAR PATTERN
Millions of bbl. daily
June gasoline demand was below what would have been normal for June last year.
1959
Curve for 1958 would have looked like this if demand for the year had followed the 1950-1958 pattern.
1958 actual
4.4
4.2
4.0
3.8
3.6
3.4
3.2
J F M A M J J A S O N D
JUNE VS. JULY BY YEARS
Millions of bbl. daily
June
July
Peak gasoline demand was in June for the 1953-56 period, but July has been top month for the last two years.
4.4
4.0
3.6
3.2
2.8
2.4
2.0
46 48 50 52 54 56 58

Three-year gasoline gain only 6.4%

BY JOHN C. CASPER

GASOLINE-DEMAND GAINS have been low for the past 3 years, particularly in the first half of each year. For example, domestic demand for gasoline for the first half of 1957 was up only 52,000 bbl. daily or 1.4% over the first half of 1956. For the corresponding period in 1958, demand gained only 0.1%, and preliminary figures show a gain of only 4.9% this year.

These figures add up to a gain of only 6.4% from 1956 to 1959. The over-all 3-year increase was slightly less than the average annual gain in the period from 1946 through 1956. The average for these 11 years was 6.8% a year.

There have been short periods of low gasoline demand in the past, but these dips never lasted more than a season. For example, gasoline demand for the first half of 1954 represented a gain of only 1.5% over the same period of 1953. The drop can be charged to the 1954 recession. Demand climbed back near the normal trend the following year. The total for the first half of 1955 represented a gain of 8.1% over 1954.

The curves on the first of the above charts show several things about gasoline demand for 1958 and the first half of 1959. One curve pictures actual domestic demand for gasoline in 1958 by months. The other curve shows the same total demand for 1958, but with the monthly breakdown changed to fit the average 1950-58 seasonal pattern.

Note that demand averages for February, March, June, and November were below the normal line. These abnormalities should be considered when demand comparisons are made this year. For example, gasoline demand for March this year showed a gain of 9.3% over March of last year. If allowance is made for March's low position last year, the gain is reduced to about 5.4%.

These curves show why normal demand in July this year may result in only a small percentage gain over last July. On the same basis, big gains can be expected in November but only minor gains in December.

The right-hand chart gives a comparison between June and July gasoline demands since the end of World War II. The averages were about equal through 1952. For the following 4 years June was the peak gasoline month of the year. July was ahead in 1957 and 1958. Refiners are hoping that July will be better than June this year.

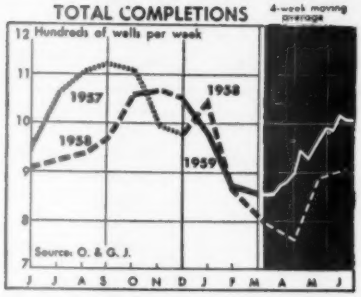
Gasoline prices . . . Spot price quotations for gasoline have been losing ground since early spring. In some areas spot gasoline may be as much as a cent a gallon below the peak summer price last year. Group 3 spot gasoline is selling for less than it did in the summer of 1953.

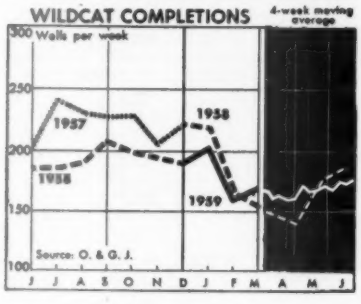
When spot prices remain low, tankwagon prices have to come down. These cuts have been showing up in recent weeks. Most of the reductions for gasoline have ranged from half a cent to 1 cent a gallon.

July has started with reports of some strengthening of the Gulf Coast market. Prices for the remainder of the season will depend on the supply-demand balance.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,015,155	DOWN	14,380	UP	639,010
Crude stocks	265,729,000	UP	2,565,000	UP	5,036,000
Completions	1,028	UP	28	UP	93
Refinery runs	7,836,000	DOWN	164,000	UP	295,000
Gasoline stocks	198,271,000	DOWN	2,353,000	UP	11,785,000
Kerosine stocks	27,213,000	UP	613,000	UP	3,358,000
Distillate stocks	115,991,000	UP	4,061,000	UP	12,638,000
Residual stocks	53,840,000	DOWN	599,000	DOWN	9,857,000
Four-product stocks	395,315,000	UP	1,722,000	UP	17,924,000
Total imports	1,648,500	DOWN	170,000	UP	119,500





Active Rotary Rigs

	6-29-59	6-22-59	6-30-58
Alabama	9	7	4
Arkansas	13	13	11
Arizona	2	2	0
California	100	98	85
Land	95	93	(*)
Offshore	5	5	(*)
Colorado	44	42	46
Florida	2	2	1
Land	1	1	1
Offshore	1	1	0
Illinois	47	50	41
Indiana	6	5	6
Iowa	3	3	3
Kansas	154	164	122
Kentucky	9	8	11
Louisiana	373	377	291
North	36	30	34
S.-Inland waters	157	156	(†)
S.-Land	128	137	214
Offshore	52	54	43
Maryland	0	0	0
Michigan	26	26	8
Mississippi	75	71	35
Missouri	1	0	1
Montana	23	24	21
Nebraska	34	35	20
Nevada	1	1	0
New Mexico	124	121	121
New York	1	1	2
North Dakota	27	33	35
Ohio	4	4	0
Oklahoma	242	246	165
Oregon	0	0	1
Pennsylvania	10	10	9
South Dakota	3	2	0
Tennessee	1	0	0
Texas	764	791	654
S.-Inland waters	5	6	(†)
S.-Land	203	205	131
Offshore	1	1	5
Northeast	159	171	(*)
West Central	246	256	(*)
West	150	152	(*)
Utah	34	39	36
Washington	1	1	0
West Virginia	9	10	5
Wyoming	95	98	60
Total U. S.	2,237	2,284	1,794
Western Canada	139	152	148
Eastern Canada	0	0	3
Grand total	2,376	2,436	1,945

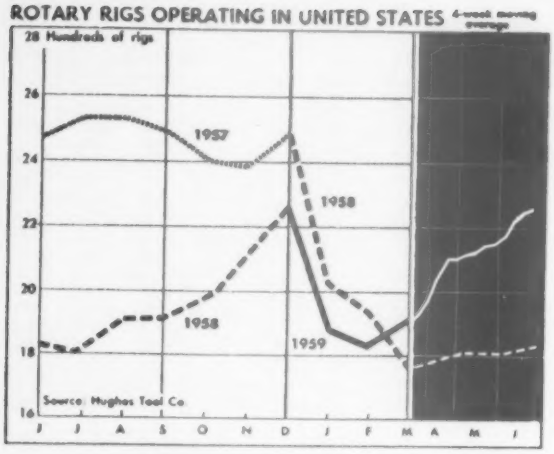
Hughes Tool Co. report. *Comparisons not available due to change in method of reporting. †Included in South-Land.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JUNE 27, 1959

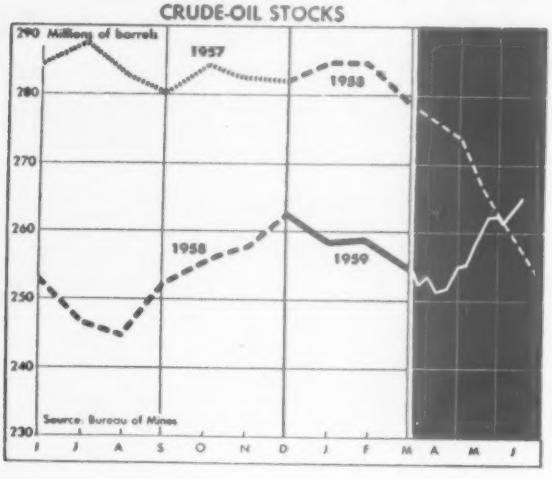
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1959	1958	Total	Crude	Cond.	Gas	Dry	1959	1958
Alabama	0	0	0	0	0	0	0	47	41	0	0	0	0	0	9	16
Arkansas	16	12	0	0	4	0	47,236	399	319	1	0	0	0	1	63	82
California	27	19	0	1	7	0	115,466	742	850	3	0	0	0	3	172	174
Colorado	14	0	1	0	13	0	65,104	356	364	11	0	0	0	11	212	196
Illinois	50	30	0	0	20	0	109,639	1,014	958	7	3	0	0	4	167	195
Indiana	25	10	0	0	14	1	42,771	367	332	8	2	0	0	6	124	129
Kansas	82	29	0	4	45	4	252,673	1,959	1,773	27	2	0	1	24	443	370
Kentucky	99	72	0	6	19	2	80,425	1,158	470	1	0	0	0	1	73	50
Louisiana	56	29	2	3	21	1	380,736	1,714	1,641	10	1	0	0	9	213	240
North	25	15	0	3	7	0	82,363	623	573	3	1	0	0	2	86	83
South	28	12	2	0	13	1	273,422	908	846	7	0	0	0	7	120	141
Offshore	3	2	0	0	1	0	24,951	183	222	0	0	0	0	0	7	16
Michigan	24	9	0	2	13	0	70,215	293	184	6	2	0	1	3	68	63
Mississippi	16	2	0	0	14	0	67,261	312	188	10	0	0	0	10	146	95
Montana	6	4	0	1	1	0	33,623	141	183	2	1	0	0	1	50	81
Nebraska	16	7	0	0	9	0	98,736	389	327	8	1	0	0	7	173	151
New Mexico	50	33	2	8	7	0	209,847	911	928	11	2	1	1	7	109	122
West	24	15	1	7	1	0	78,486	406	430	3	1	0	1	1	32	52
East	26	18	1	1	6	0	131,361	505	498	8	1	1	0	6	77	70
New York	0	0	0	0	0	0	0	110	284	0	0	0	0	0	13	31
North Dakota	13	8	0	0	5	0	70,139	247	211	0	0	0	0	0	48	69
Ohio	11	4	0	1	3	3	27,006	462	512	1	0	0	0	1	13	5
Oklahoma	96	35	5	15	41	0	424,036	2,811	3,185	12	1	0	1	10	427	438
Pennsylvania	0	0	0	0	0	0	0	261	237	0	0	0	0	0	4	7
Texas	381	231	11	11	124	4	1,632,673	9,281	8,853	58	4	1	0	53	1,713	1,820
Dist. 1	16	8	0	0	8	0	62,266	551	494	3	0	0	0	3	153	200
Dist. 2	25	4	5	5	11	0	161,507	396	386	10	1	0	0	9	112	99
Dist. 3	20	11	1	0	8	0	112,231	550	646	4	0	0	0	4	116	134
Dist. 4	31	14	1	2	14	0	131,735	641	597	5	0	0	0	5	158	173
East	15	8	1	0	6	0	81,454	530	598	3	0	1	0	2	114	171
Dist. 7-B	52	26	0	0	26	0	146,928	1,298	1,157	9	1	0	0	8	339	325
West	128	98	3	0	27	0	649,795	2,899	2,620	15	1	0	0	14	358	369
Dist. 9	71	49	0	1	17	4	181,073	1,762	1,745	7	1	0	0	6	308	298
Dist. 10	23	13	0	3	7	0	105,684	654	610	2	0	0	0	2	55	51
Utah	5	1	0	0	4	0	20,224	170	203	3	1	0	0	2	48	37
West Virginia	9	1	0	5	3	0	25,620	343	339	0	0	0	0	0	9	10
Wyoming	18	7	0	1	9	1	87,785	417	347	7	0	0	0	7	140	99
Misc. (Va., Md., S. D., Ore.)	14	1	0	11	2	0	58,474	58	51	1	0	0	0	1	29	43
Total U. S.	1,028	544	21	69	378	16	3,919,689	23,962	22,780	187	20	2	4	161	4,466	4,523
Previous week	1,000	480	27	86	383	24	3,994,264	.....	.....	173	20	1	7	145	.....	.....
Cum. 1959	23,962	12,210	600	1,730	8,880	622	99,342,796	.....	.....	4,466	466	63	134	3,823	.....	.....
Cum. 1958	22,780	11,261	564	1,691	8,725	539	96,047,661	.....	.....	4,523	431	74	142	3,876	.....	.....
Western Canada	40	27	0	5	8	0	170,862	1,174	1,148	3	0	0	0	3	370	376

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	6-20-59	6-13-59	6-21-58
Pennsylvania	2,453	2,474	2,904
Other Appalachian	2,031	2,032	1,601
Illinois, Indiana, Michigan	9,524	9,977	11,262
Nebraska and North Dakota	2,821	2,664	2,147
Kansas	10,680	10,245	10,349
Oklahoma	16,497	16,773	16,665
Arkansas	2,089	1,777	2,322
Louisiana	18,550	18,261	16,871
North	3,083	3,226	2,897
South	15,467	15,035	13,974
Mississippi, Alabama, Florida	2,431	2,301	2,030
New Mexico	8,325	8,149	7,083
Texas	115,415	115,988	108,208
East Texas	9,610	9,745	7,620
West Texas	54,894	54,481	51,281
Texas Gulf	18,724	18,848	21,102
Other Texas	32,187	32,914	28,205
Wyoming	16,330	16,431	15,101
Other Rocky Mountain	9,690	8,936	8,151
California	32,376	32,144	39,099
Foreign	†16,517	15,012	16,900
Total	265,729	263,164	260,693

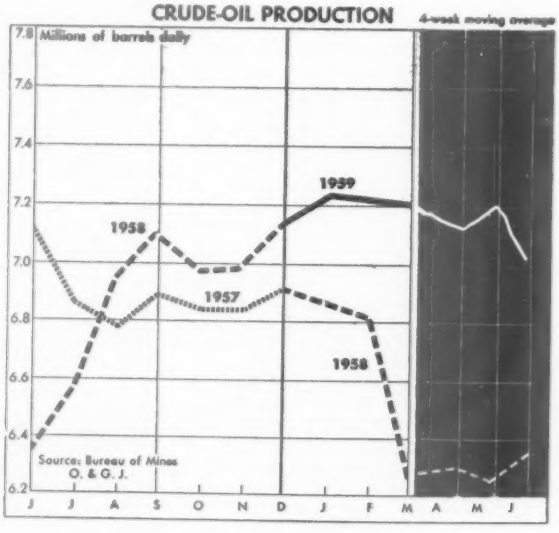
*Bureau of Mines. †Includes 4,062,000 bbl. in California.

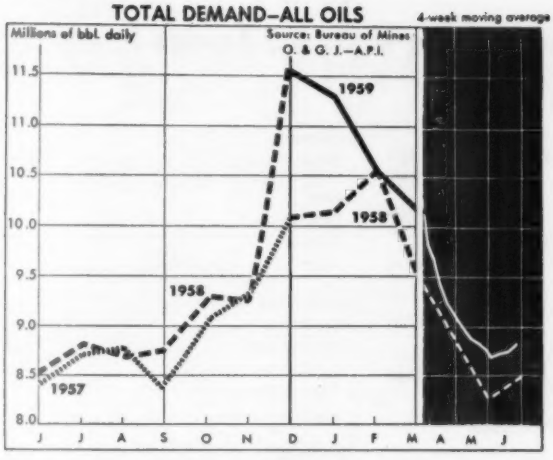
DAILY AVERAGE PRODUCTION FOR WEEK

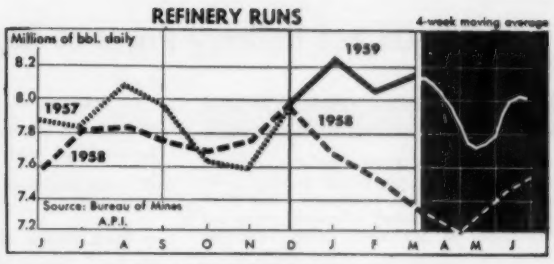
	June 27 Crude oil	June 27 Lease condensate	June 27 Total	June 20 total
Alabama	16,050	.....	16,050	16,200
Arkansas	81,000	250	81,250	81,000
California	847,700	.....	847,700	845,500
Colorado	126,500	.....	126,500	127,800
Eastern	41,000	.....	41,000	42,000
Florida	1,300	.....	1,300	1,300
Illinois	214,900	.....	214,900	209,800
Indiana	30,700	.....	30,700	31,500
Kansas	†326,545	.....	†326,545	†336,750
Kentucky	85,300	.....	85,300	§82,700
Louisiana	867,625	104,600	972,225	972,100
North	110,125	4,600	114,725	114,600
South	757,500	100,000	857,500	857,500
Michigan	26,300	.....	26,300	25,300
Mississippi	130,825	.....	130,825	§130,825
Montana	76,100	.....	76,100	78,300
Nebraska	62,800	.....	62,800	62,100
Nevada	100	.....	100	100
New Mexico	289,000	4,300	293,300	293,300
North Dakota	34,600	.....	34,600	37,500
Oklahoma	†541,300	.....	†541,300	†555,500
Texas	2,575,000	71,625	2,646,625	2,646,625
Dist. 1	43,500	2,900	46,400	46,400
Dist. 2	109,500	7,700	117,200	117,200
Dist. 3	352,000	35,000	387,000	387,000
Dist. 4	178,000	8,800	186,800	186,800
Dist. 5	29,000	350	29,350	29,350
Dist. 6	109,000	6,500	115,500	115,500
East Texas field	141,000	.....	141,000	141,000
Dist. 7-B	132,000	100	132,100	132,100
Dist. 7-C	122,000	3,625	125,625	125,625
Dist. 8	1,048,000	4,000	1,052,000	1,052,000
Dist. 9	205,000	1,800	206,800	206,800
Dist. 10	106,000	850	106,850	106,850
Utah	116,800	.....	116,800	113,200
Wyoming	342,800	.....	342,800	340,000
Others	‡135	.....	‡135	‡135
Total U. S.	6,834,380	180,775	7,015,155	§7,029,535
Change from previous week, down			14,380	
Canada	†517,600	.....	†517,600	†538,500
Total U. S. production, January 1-June 27			§1,278,543,670 bbl.	
Same period last year (crude plus cond.)			*1,150,816,090 bbl.	

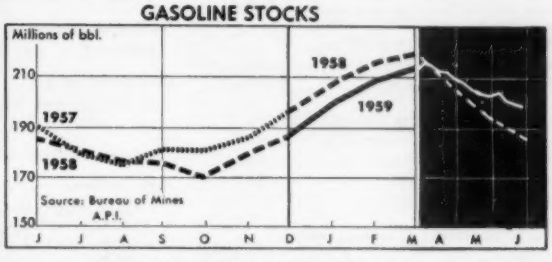
*Includes 29,122,700 bbl. condensate. †Week ended previous Monday. ‡Arizona, South Dakota, and Washington. §Revised.

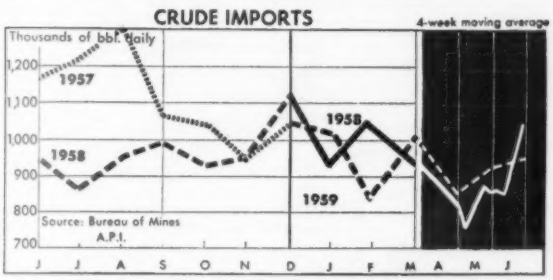
CRUDE-OIL PRODUCTION

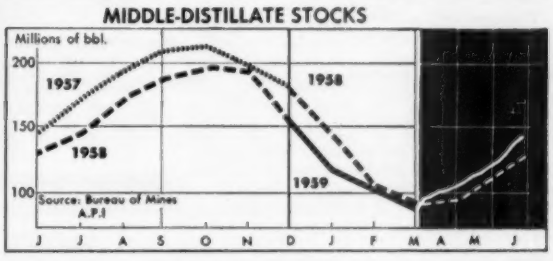


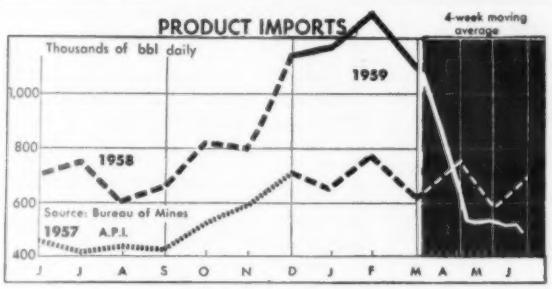


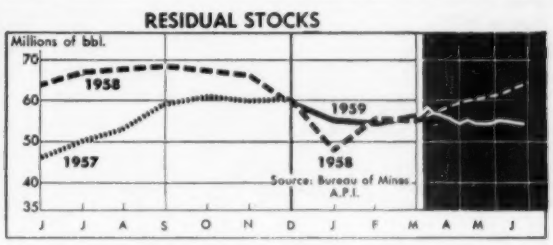












API REFINERY REPORT—JUNE 26, 1959

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, June, 1958—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,078	495.0	17.6	261.6	183.0	45,830	9,829	39,887	12,157	1,093	497.9	20.1	285.4	171.9
Appalachian:														
Dist. 1	106	44.7	6.1	26.0	6.0	5,595	533	2,465	294	94	42.2	2.5	21.6	5.8
Dist. 2	110	51.3	6.1	24.4	10.7	2,644	482	1,122	167	108	55.4	5.7	17.3	7.3
Ind., Ill., Ky.	1,499	768.7	56.3	304.9	157.7	34,829	5,468	18,254	3,983	1,373	718.9	60.3	265.0	124.5
Minn., Wis., Dak.	112	54.7	4.4	25.6	12.0	6,551	855	4,649	381	109	53.0	5.7	28.4	10.0
Okla., Kans., Mo.	704	426.2	14.9	178.3	23.9	18,254	1,275	8,123	701	742	416.4	12.5	174.9	25.5
Inland Texas	295	218.4	8.3	50.7	16.3	7,090	282	1,612	2,030	272	192.9	5.3	45.3	18.2
Texas Gulf Coast	1,734	957.7	83.2	442.7	158.9	26,236	4,073	15,433	5,130	1,633	839.3	68.4	382.6	178.6
La. Gulf Coast	706	380.0	38.1	191.3	57.0	11,397	2,912	6,687	1,461	613	362.0	38.2	149.2	45.0
N. La. and Ark.	101	46.1	8.0	18.3	6.1	4,790	724	2,130	174	100	41.7	4.3	25.5	6.6
Rocky Mountain:														
New Mexico	25	11.6	0.3	5.0	3.4	721	49	178	109	27	13.5	0.5	5.1	2.5
Other Rocky Mt.	306	133.0	0.9	76.0	34.4	5,688	294	2,349	1,100	294	134.6	3.5	61.1	30.7
West Coast	1,060	510.0	7.4	179.1	300.0	28,646	437	13,102	26,153	1,069	485.6	5.6	150.0	284.8
June 26, 1959	7,836	4,097.4	251.6	1,783.9	969.4	198,271	27,213	115,991	53,840	7,527	3,853.4	232.6	1,611.4	911.4
June 19, 1959	8,000	4,083.4	266.3	1,818.7	901.4	200,624	26,600	111,930	54,439	.....	.....	.....	.....	.....
June 27, 1958	7,541	3,865.9	235.6	1,604.1	946.4	186,486	23,855	103,353	63,697	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):

★ Regular (89 octane)	11.00-11.25
★ Premium (99 octane)	14.00-14.25

Gulf Coast (cargoes for coastwise or export movements):

★ Regular (90 octane)	10.00-10.25
★ Regular (92 octane)	10.25-10.50
★ Premium (98 octane)	11.375-11.625

California (rack) (Los Angeles):

Regular (88 octane)	12.50
Premium (94 octane)	13.50
Premium (100 octane)	15.00

Caribbean area (cargoes):

★ Regular (87 octane)	9.875
★ Premium (97 octane)	11.625

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:

Grade 26-70	4.5

Breckenridge:

Grade 26-70	4.0

*If 26-70 natural is considered as 100%, prices for lower-vapor-pressure grades increase 2.5% for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):

Kerosine 42-44	9.25-9.75
Diesel oil (58 d.i. and above)	9.00-9.50
Distillate No. 1	9.00-9.50
Distillate No. 2	8.25-8.75

Gulf Coast (cargoes):

★ Kerosine 41-43	8.375-8.50
★ Distillate No. 2	8.00-8.25

New York Harbor (barges):

Kerosine 41-43	9.90
Distillate No. 2	9.40
Diesel fuel, 48-52 d.i.	9.65

Caribbean area (cargoes):

Distillate No. 2	8.25

WAX (LB.)

Oklahoma (Group 3):

132-135 A.m.p. (semi-refined) in tank car	6.50

New York (export):

126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.85-2.00
Gulf Coast (cargoes):	
Bunker C fuel	$2.00
New York Harbor (barges):	
Bunker C fuel	$2.37
Caribbean (cargoes):	
Bunker C	$2.00
California (rack):	
Bunker C fuel, Los Angeles	$2.15

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 pp., 95 v.i.	23.0
200 vis. neutral oil, solvent refined, 0-10 pp., 95 v.i.	20.5
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	22
200 vis. neutral (180° at 100°), 25 p.t.	21

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	Gulf Coast Tex.*	West Tex.† N.M.	Wyo. (sour)
14-14.9	$1.86	....	....	....	....
15-15.9	1.95	....	....	....	$1.81
16-16.9	2.04	....	....	....	1.86
17-17.9	2.13	....	....	....	1.91
18-18.9	2.23	....	....	....	1.96
19-19.9	2.32	....	....	....	2.01
20-20.9	2.41	$2.49	....	$2.35	2.06
21-21.9	2.50	2.52	....	2.38	2.11
22-22.9	2.60	2.55	....	2.41	2.16
23-23.9	2.69	2.58	$3.44	2.44	2.21
24-24.9	2.78	2.61	3.46	2.47	2.26
25-25.9	2.84	2.64	3.48	2.50	2.31
26-26.9	2.90	2.67	3.50	2.53	2.36
27-27.9	2.95	2.70	3.52	2.56	2.49
28-28.9	3.01	2.73	3.54	2.59	2.54
29-29.9	3.07	2.76	3.56	2.62	2.59
30-30.9	3.12	2.79	....	2.65	2.63
31-31.9	3.20	2.82	....	2.68	2.67
32-32.9	3.27	2.85	....	2.71	2.71
33-33.9	3.34	2.88	....	2.74	2.75
34-34.9	3.41	2.91	....	2.77	2.79
35-35.9	3.47	2.94	....	2.80	2.83
36-36.9	3.52	2.97	....	2.83	2.87
37-37.9	3.56	2.99	....	2.86	2.89
38-38.9	....	3.01	....	2.89	2.91
39-39.9	....	3.03	....	2.92	2.93
40-40.9	....	3.05	....	2.95	2.95

*Low cold test crude. †Sour.

Effective dates of broad changes: California, 1-26-59; East of California, January 3-10, 1957; Pennsylvania Grade 4-1-59.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.25
Middle District	4.07
Southwest Pennsylvania	3.80
West Virginia	3.62
Buckeye Grade	3.47
Illinois Basin	3.00

FOREIGN

Canada:	
Leduc-Woodbend	2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38
Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.34
San Joaquin, 41°-41-9°, Puerto La Cruz	3.08-3-10
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° very 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes f.o.b. lifting port):	
Arabian, about 34°, Ras Tanura	$1.89
Iranian, 34.0°-34.9°, Bandar Masur	1.86
Iranian, 34.0°-34.9°, Abadan	1.81
Iraq, 36.0°-36.9°, Fao	1.82
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.67
Qatar, about 41°, Um Said	2.05
Middle East, E. Mediterranean:	
Arabian, about 35°, Sidon	2.29
Iraq, about 35°, Tripoli, Banias	2.29
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.57

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-USNH, clean (USMC—20%)	$2.28
★ Gulf-USNH, dirty (ATRS—30%)	2.00
Carib.-USNH, dirty (ATRS—55%)	1.24
★ PG-Japan, dirty (USMC—46%)	5.51

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FOR SALE EQUIPMENT

1800 FT. DRILL PIPE @$1.75, WAK Waukesha engine with Twin Disc Clutch—good condition, $1,875.00 4¼ x 40 ft. Kelly with National Bushings $300.00, located in Cleveland, Oklahoma, Phone 609, Cleveland, or GI 7-0323, Tulsa.

FOR SALE—New spare parts for type KVG 60 hp. gas engine compressors. Including: Power cylinders, liners, inlet & discharge valves, piston rods, shoes, oil coolers, etc. Price right. Send for complete list. Brill Equipment Co. 2401 Third Ave. New York 51, N. Y.

GAS COMPRESSORS: Clark RA-4, 400 HP; Clark RA-32, 300 HP; Ingersoll-Rand XVG-8, 330 HP; 10¼" x 10½" CD-105 Cooper-Bessemer compressor cylinders. Alfred B. Kern, 305 Kennedy Bldg. Tulsa, Oklahoma.

BUCYRUS-ERIE 36L—Late model skid mounted Cummins Diesel 150 H.P.-4000 Ft. ⅞ and ⅝ lines. Safety lights on rig—3 complete strings of tools and bailers, doghouse, diesel light plant forge attached. Flooring, hand tools. Priced to sell. W. H. Obins, Fairfax, Oklahoma or W. G. Obins, Shidler, Oklahoma.

BUCYRUS ERIE 22W Spudder. Excellent condition, complete with tools and equipment. Would trade for dozer. B. E. Wagley, 500 Ave. H, Cisco, Texas. Phone Hillcrest 2-1629.

170 HP TYPE 80 Twin Cooper Gas Compressors, complete, dismantled for loading. $2250 each. P. O. Box 1353, Tulsa, Oklahoma.

—PIPE—

500,000 FT. 10¾" 40#
250,000 FT. 8⅝" 28½ LB.

All machine cleaned, straight, plain end, coated. Strickley No. 1, Pittsburgh Test. Lab. report furnished. Indiana-Ohio Pipe Co.
P. O. Box 323, Phone 34674, Decatur, Ind.

—FOR SALE—

2 Westinghouse 1500 KW Motor Generator Sets.
These identical units have 1500 KW gens. producing 6000 amps. @ 250V DC. The motors are Westinghouse 2140 HP., synchronous, 514 RPM, 3/60/4600V, self excited. Complete with starting compensator, oil circuit breakers & DC panel. New in 1934 and have been maintained in EXCELLENT condition.
New cost approx. $180,000.00 each
Price, loaded $ 37,500.00 each

1 USED Air Compressor, 2000 cu. ft., Ingersoll Rand, with synchronous center drive, self lubricated 3/60/440V.

HERMAN MACHINERY AND SUPPLY CO.
2795 E. 83rd Street, Cleveland 4, Ohio
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REASONABLY PRICED

22,000' 5" OD USED P. E. R-2 J-55 14.87# SEAMLESS PIPE
6,500' 2⅞" OD HYDRILL DRILL PIPE. HAVE TUBOSCOPED RECORD
1—150 TON B.J. HOOK
1—IDECO 5 SHEAVE CROWN BLOCK GROOVED FOR 1¼" LINE
1—B.S. & B. 1,500# TEST 2 STAGE HORIZONTAL SEPARATOR. JUST LIKE NEW

FAIRWAY PIPE & SUPPLY CO., INC.
3943 Greenwood Road, Shreveport, La.,
—Phone 6-1861—

FOR SALE EQUIPMENT

1500 FAILING HEAVY duty, long mast, kelly. 22 Bucyrus complete. Good 2⅜", 2⅞" drill pipe. Fred Butler, Box 481 Pueblo, Colo.

SACRIFICE WICHITA 64 spudder. Lines, Dog House, Mast. No tools. Cummins Diesel Power. Total price $2,750.00. Phone FE 2-5617, Box 1864, Odessa, Texas.

One 600 H.P. Climax V-125 12 cylinder engine and belt driven 2 stage Gardiner-Denver gas compressor with shed—all unitized, glycol dehydration and gas cooling equipment and several thousand feet of 6", 4" and 3" pipe lines and complete control equipment to handle 1.75 M³cf gas per day at 800 psi from 40 psi. All in good condition. Reply P. O. Box 311, Hammond, Louisiana.

FOR SALE EQUIPMENT

FOR SALE—National 80 rig in Four Corners area. Inventory on request. Also 127' Lee C. Moore mast, C-250 pumps, rotary table, drill pipe, & misc. equipment. Hi-Z Rental Tool & Supply Co. Ph. LO 5-8612, Box 476, Cortez, Colorado.

8⅝" O. D. NEW LINE PIPE BELOW MILL

6728 feet of New Electricweld PRIME Grade A.P.I. Specification 5L, Grade B, .250 Wall, 22.36# Plain End Beveled, Double Random Lengths and Coated.
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- 2—22,500 CFM I.R. Turbo Blowers 29.7 Psia. 1700 HP. Turbine
- 2—C.P. Steam Driven Air Compressors 496 CFM @ 40 Psig.
- 4—Reactors 8' x 32' and 8' x 88'
- Reactor, Stripper & Scrubber 12'6" x 112' Stainless Internals
- 2—Waste Heat Boilers 4,670 sq. ft., 175 psi.
- 2—Catalyst Storage Hoppers 25' x 70' Cone Bottoms
- 3—7000 BBL. Acid Tanks ½" to ¼" Plate Welded
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New York Office—60 East 42nd Street, New York 17, N.Y., MUrray Hill 7-5280
Tulsa Office—306 Thompson Bldg., Tulsa 3, Okla., Diamond 3-4890

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FOR SALE EQUIPMENT

PLANT LIQUIDATION—Gasoline Plant at Benavides, Texas, 2,000 bbl. Crude Topping unit; Depropanizer & Debutanizer complete; misc. columns; vessels; pumps; heat exchangers; gas compressors; Oil heaters; Oil & Gas Separators; atmospheric sections; Propane & Butane Storage Tanks; other tanks 250 to 3,000 bbl. capacities; steel buildings. Send for list. KINSLOW EQUIPMENT COMPANY, P. O. Box 5283, Tulsa 12, Oklahoma.

FOR SALE—Used Lincoln 200 AMP Portable welding machine, Pipe Line Special. Completely reconditioned. Price right—Aaron Ratliff, 1545 Cynthia Lane, Wichita Falls, Texas, 767-4565.

FOR SALE—133' IDECO Full View Portable Mast, 9' Substructure, Wilson Giant single drum drawworks, complete with two engine compound, Oilwell 20½" rotary table with torque converter, 7⅛ x 16 Bethlehem G-300 Pump. Excellent condition guaranteed. Kirkpatrick Oil Co., 1300 N. Broadway, Oklahoma City, Phone CE 9-1416.

RL CARDWELL cable tool workover rig. Five and six inch tools. Tubing tools. Good lines. Machine in excellent condition. $14,000 total price. Phone FE 2-5617, Box 1864, Odessa, Texas.

FOR SALE EQUIPMENT

3,200'—3" Drill pipe, located Seminole Oklahoma. 1 Horizontal Separator, 500# Wkg. Press Located Cement Oklahoma. Markwell Drilling Corp., 111 N W 23rd St., Oklahoma City, Oklahoma. JAckson 8-5896.

WELL DRILLS - CORE DRILLS. Everything for well and core drilling in both new and used equipment at money saving prices. Fishing tools rented. Send for bulletins. Pressey & Son, Pueblo, Colo.

OIL WELL FRACTURE
AND CEMENTING TRUCK
with pumps, etc. Sacrifice. Private Party. Dealers welcome. 1531 Kenneth Road, Glendale, Calif. CH 5-5917.

FOR SALE to the highest bidder—One 1956—R194 International 5-ton oilfield truck w/456 International engine. One rebuilt Feigelson Tandem pole trailer. One 1947—WRA-69 Dodge 3-ton crane truck. One shop-made single pole trailer. One 1956—F600 Ford truck w/5-man cab. One 1954—6300 Chevrolet truck w/5-man cab. One D-7 Caterpillar Diesel equipped w/Hyster D7N worm drive winch. Descriptive list will be mailed with bidding instructions upon request. Shell Oil Company, P.O. Box 1509, Midland, Texas, Attention Mr. J. W. Benn.

FOR SALE EQUIPMENT

SELL OR TRADE—Three Cardwell R. C. Double-Drum Spudders complete, now working in Northern Oklahoma, good lines and tools, reasonable price. Box 4294, Oklahoma City 9, Phone OR 7-2242.

FIVE NEW Byron-Jackson & Bingham multi-stage Pipe Line Pumps 350-400 GPM @ 1130'-1450' head; Nine used Clark Bros. Gas Compressor cylinders 4½" x 14" Type VSF, 3,000 psi. WP; 37 Shell & Tube Heat Exchangers, all floating head, 200 to 2,000 sq. ft. area. Send for list KINSLOW EQUIPMENT COMPANY, P. O. Box 5283, Tulsa 12, Oklahoma.

—FOR SALE—

300 Ton—Green window glass Cullet—which will be removed from tank.

Several Carloads—Silicon tank blocks and new silicon brick & shapes for tank.

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SLIM HOLE DRILLING RIGS

Two portable 7,000 ft. Cardwell
Two portable 3,000 ft. Cardwell
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Attractively priced. Inventories on request.

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Telephone: AM 5-2611

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Rebuilt 1959. 16" hallow spindle. 36" swing 25' CC on lathe end. Two carriages with tapers. 25' boring attachment. 40-20-10 HP motor drive. Bargain prices. Terms —Return Guarantee.

Phone collect—EDison 4-9471-2
THE EVEREADY SUPPLY CO.,
Box 638
Bridgeport, Connecticut

EQUIPMENT WANTED

BOTTOM HOLE pressure equipment including bombs, measuring assembly, and auxiliary equipment. Box 1388, Wichita Falls, Texas.

WE MUST BUY used drilling and fishing tools for drilling machines, to be used from 6⅝ to 13⅜ API casing. Send your inventories to: P. Naveiro, Calle 23 #105, Room 205, Vedado, Havana, Cuba.

LOW & HIGH Pressure fractionating columns 2' dia. up, various lengths. KINSLOW EQUIPMENT COMPANY, P. O. Box 5283, Tulsa 12, Oklahoma.

HELP WANTED

NEW OIL EMPLOYMENT Directory, foreign and domestic, showing where to apply for jobs. 500 selected producing, refining, LPG and pipeline companies. Nationwide. $7.50 cash. OIML Co., Box 2603, Tulsa, Okla.

ENGINEER with experience in thermal and mechanical design of fired heaters for use in the Petroleum and Petro Chemicals Industry. Phone or wire: Max Brady, 3515 Dawson Road, Tulsa, Oklahoma, WE 9-6371.

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Personnel Manager,
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USED Bethlehem MC-650 Rig Complete with 3—LRO Waukesha Engines . . . 8" x 18" and 8" x 16" Bethlehem Pumps . . . 7¼" x 14" G-D Pump with NKU Engine . . . 14,000'—4½" E Drill Pipe . . . 18 Drill Collars . . . Cameron B. O. Preventers . . . Steel Pits. Now drilling Southern Oklahoma.

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Liquidation Site Office—Destrehan, La.—Telephone Norco 6571

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Production Engineers

Well known expanding major oil company has openings in district offices of domestic oil and gas producing operation. Minimum of three years production experience required; water flood experience desirable. Response should include salary expected and complete resume of education and experience. Our employees have been informed of this advertisement.

Box L-309,
The Oil and Gas Journal,
Tulsa, Oklahoma.

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Drilling contractor needs toolpushers with prior foreign experience for Colombia and other countries in South America. To age 45.

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Large Southern California independent oil company with modern refinery and excellent growth prospects needs chief engineer. Under general direction of Manager of Manufacturing will be in direct charge of all refinery engineering activities, including design, inspection, construction and maintenance. B.S. degree in Engineering is necessary, preferably mechanical. Must have minimum of five years experience in refinery engineering activities including supervisory and administrative responsibilities. Prefer some experience in medium to small refinery organizations. Age 32—40. All replies confidential. Send complete resume of experience and qualifications, snap-shot and salary requirements to:

Personnel Manager
WILSHIRE OIL COMPANY OF CALIFORNIA
P. O. Box 2487,
Santa Fe Springs, California

SITUATION WANTED

GEOLOGIST AND ENGINEER, 30 years age, Hungarian, married, available July 1 as permanent resident. Well trained in reservoir engineering. Speaks five languages including English. Will furnish full qualifications on request. Please write: Box L-404, The Oil and Gas Journal, Tulsa, Oklahoma.

B. S. PETROLEUM, Age 28, 5 years major company experience, production and reservoir engineering. Desires relocation with independent. Box L-405, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN—36, family, can handle all phases of independent's exploration program except geology. Minimum starting salary $10,500. Box L-399, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, BS, 32, 4 years diversified field production engineering with major including miscible and water flood development, design and supervision. Presently employed. Desire position with opportunity for responsibility and advancement. Box L-403, The Oil and Gas Journal, Tulsa, Oklahoma.

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TEN YEAR Gulf Coast Miocene Geologist, 36—family man—presently located in South Louisiana. Eight years with major companies—including: two years offshore experience, two years with independents. Resume on request. Available now. Box L-400, The Oil and Gas Journal, Tulsa, Oklahoma.

MR. OIL MAN—Independent Geologist available for retainer. Permanent offices in Shreveport. Proven oil finding ability. Box L-385, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

OIL GAS LEASES: East, Southeast Texas. Production near. Want producer go deep get oil, paying quantities. L. E. McCausland, 400 Boulevard, Shreveport, La.

6,000 ACRES 10 YEAR oil and gas leases. Adjoins block with test well having oil sands over 2,000 feet deep. Approximate 38 gravity oil. Western Missouri. Box L-401, The Oil and Gas Journal, Tulsa, Oklahoma.

80 ACRES ON PIPE line—3 possible pays. Recent 50 bbl. an hour wells near by. High gravity oil. Wells in vicinity produced 40 years. Priced low, ⅛ $500.00 lease, well drilled, in tank. L. Price, Coweta, Okla.

KENTUCKY—1,600 acres, Casey county, near Knox test, now drilling, 5 year leases, $1.00 annual rental, $3.50 per acre, ⅛ over ride. 1,400 acre block Pulaski county, near new shallow wells, 25 cents annual rental, $5.50 per acre, ⅛ over ride. Wire—phone: W. V. Cravens, Russell Springs, Kentucky.

80 ACRE LEASE between two floods. Major Co. ½ mile one way, abuts flood the other way. 3 stripper wells, producing 3 bbl./day. $10,000.00. Box L-391, The Oil and Gas Journal, Tulsa, Oklahoma.

I WILL DRILL your shallow prospect or buy your producing interest. U. S. Andersen, 8350 Santa Monica Blvd., Los Angeles 46, Calif.

WATER FLOOD Franklin County, Kansas. 640 acres, good engineering and best equipment, modern in every respect. Wonderful potential, good reason for selling. No brokers. Unless you are financially responsible do not reply. Box L-326, The Oil and Gas Journal, Tulsa, Oklahoma.

ARIZONA HOT SPOT, Apache County Oil-Gas Leases Available. For free information write Box 31 R 213, The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif.

140 ACRES, producing 28 bbl./day, adjoining Major Company flood. Cored test hole shows 34,750 barrels per acre total oil. $22,000 cash, $48,000 oil payment. Box L-392, The Oil and Gas Journal Tulsa, Oklahoma.

CUMBERLAND COUNTY KENTUCKY—212 acres, 5 yr. term. Annual rental, $1.00 per acre. Shallow production adjoining two sides. Price $30.00 per acre, ⅛ over ride. Write, wire, phone Luther L. Shepherd, Burkesville, Ky.

Caddo-Pine Island Field

160 acre federal oil and gas lease, full five year term, in T. 21 N., R. 16 W., La. Mer. S½SE¼, Sec. 2; and E½SE¼, Sec. 11. High bidder at federal auction will assign outright or with small override.

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To drill proven gas-distillate wells 8,800 ft. inside locations, off-set wells dualed and tripled completions, additional tested sands behind the casing Texas Gulf Coast. Prio sand production. Complete engineering reports. Principals only. Bank references exchanged. Phone:
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HI 4-1393, Austin, Texas
OGDEN OIL COMPANY
P. O. Box 464, Taylor, Texas.

OHIO LEASES 1,000 ACRES, Ashtabula County. Some aprox one mile from wells making 5 to 7 million after frac, Clinton sands 3,300 depth with aprox. 45 ft. of pay. Pennsylvania Elk and Clearfield Counties some leases within mile to two miles of Oriskany wells making 5 to 45 million. For full information write, A. L. Heinrich, Kittanning, Pa.

LEASE AND DRILLING BLOCKS

11,000 ACRE BLOCK ten year oil and gas leases, near core test now drilling to granite in Western Missouri. Oil and gas area indicated in several stratas near granite. Will assign on basis of drilling commitment and override. Box L-402, The Oil and Gas Journal, Tulsa, Okla.

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OFFERING OIL AND GAS Income Royalties and those ahead of drilling. A. S. Berry, 109 Midco Bldg., Tulsa, Oklahoma.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

PRODUCTION FOR SALE

EASTERN KANSAS 640 acres partially developed production. Box No. 1, Independence, Kansas.

PRODUCTION WANTED

WANTED: Oil properties. 100 to 5,000 barrels daily in Oklahoma and Kansas. Morris Sitrin, P. O. Box 1160, Tulsa, Okla.

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BIG CAPITAL AVAILABLE—Principals want Texas production or oil deals. Give brief details. Will reply only to offers of interest. P. O. Box 4332, Austin 51, Texas.

OIL FIELD ENGINE BUSINESS, four corners, three major engine lines, substantial industrial jobber accounts. Will lease or sell building. Mountain climate, trout fishing ten minutes away, big game hunting. Excellent potential. Will sell outright or controlling interest. P. O. Box 1636, Farmington, New Mexico.

FINANCIAL CONTACTS, Underwriters, Private Brokers reached. No shopping. Confidential. Send details to Consultant—817—51st Street, Brooklyn, N. Y.

NEW PRODUCTS WANTED—Well-established, responsible company with complete facilities for developing, manufacturing and marketing oil field equipment is seeking new or improved products, preferably patented or patentable, to add to its presently well-known line. Royalty basis or outright purchase. Initial submission should identify product and general use without revealing engineering and confidential detail. Submissions will be handled promptly and confidentially. Box K-994, The Oil and Gas Journal, Tulsa, Oklahoma.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that 4,090.96 acres of land in 10 parcels within the known geologic structure, undefined, of the Low Gap Area, Johnson County, Arkansas, will be offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 1:00 P. M., E.S.T., July 15, 1959, when bids will be opened. Full details of the lease offering, and how and where to submit bids, may be obtained from the Bureau's Eastern States Land Office, Washington 25, D. C. H. K. Scholl, Manager, Eastern States Land Office, Washington 25, D. C.

LEGAL

SEALED BIDS will be received until 10:00 A.M. Mountain Standard Time, July 28, 1959, and opened at that time in the Office of the Navajo Indian Agency, Window Rock, Arizona, for oil and gas leases on 21 tracts of tribal lands, totaling approximately 3,291.00 acres, located in San Juan County, Utah.

Details of the lease offering and filing of bids may be obtained by addressing an inquiry to the General Superintendent, Navajo Indian Agency, attention: Branch of Realty, Window Rock, Arizona.

LEGAL

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D.C. Notice is hereby given that approximately 39.70 acres of land within the known geologic structure of Monroe gas field, Louisiana, will be offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 1:00 p.m., E.S.T., August 5, 1959, when bids will be opened. Full details of the lease offering, and how and where to submit bids, may be obtained from the Manager, Eastern States Land Office, Bureau of Land Management, Washington 25, D. C. H. K. Scholl, Manager.

EQUIPMENT MEN
. . . in the News

Major personnel realignment

. . . is completed by Servco in its Gulf Coast area. Paul W. Westerlund, president, announced that Leo Franques is now general manager, Gulf Coast operations; Marc Loy has been made

Leo Franques

Marc Loy

Jim McCaskill

Dick Boothe

general sales manager in the area; Jim McCaskill is the new manager of Texas operations; and Dick Boothe is manager of Louisiana operations.

John W. Pennington made

. . . general manager of the piston ring and seal department, and William B. Sawers was made manager of the coupling department, of the Metal Products Division of Koppers Co., Inc., according to H. B. Cummings, vice president of Koppers and general manager of Metal Products. Pennington joined Koppers in 1950 after serving for 11 years with Caterpillar Tractor Co. Sawers joined Koppers in 1927, immediately after graduation.

Ben Sloat is sales engineer

. . . in the Southwest for Hagan Chemicals & Controls, Inc., and its divisions, Calgon Co. and Bradford Laboratories. He will headquarter in Tulsa. Formerly a Hagan product engineer in Pittsburgh, Sloat has done extensive work in oil-field water problems relating to secondary recovery.

Houston industrial ad agency

. . . changes its name to reflect new affiliations. Persons-Beauchamp Advertising, Inc., is the new name for the agency group formerly known as McCarty Co. According to Ed Beauchamp, president of the Houston firm, the name was changed to indicate the company's association with Persons Advertising, Inc.'s, New York City, of which Howard Persons is president. Both the Houston and the New York agencies were previously affiliated with McCarty Co.

Multi-Color Process Co.

. . . a decal and nameplate manufacturer, Tulsa, has announced the opening of a sales office in Dallas to handle sales in North Texas. Jack Casey, Jr., a member of the sales department, has been shifted to Dallas to head the office.

TIGHT SQUEEZE FOR BIG TANK—Graver Tank & Mfg. Co. delivered this giant tank, one of the largest pressure vessels ever shop-built, to a Sinclair Oil refinery in East Chicago. The tank, with a capacity of 133,400 gal., is 136-ft. long, has a diameter of 13 ft., and weighs 105 tons. A door was enlarged, a fence was leaned, and a special train of three flat cars was required to move it. Designed by the engineering firm of C. F. Braun & Co., Alhambra, Calif., it will serve as an acid settler in an alkylation unit.

Carl B. McLaughlin elected

. . . president of Tube Turns Plastics, Inc., Louisville, Ky. He had been executive vice president since the company was formed in 1954. He succeeds George O. Boomer who has become chairman of the executive committee.

C. B. McLaughlin

For 11 years before formation of Tube Turns Plastics, McLaughlin served with Tube Turns Division of Chemetron Corp., heading its engineering service.

Warren Barr is supervisor

Warren Barr

. . . of training for Halliburton Oil Well Cementing Co.'s northern region. He had been district superintendent at Vernal, Utah and had also served for 2 years as division training supervisor. Harry P. Conroy, vice president, field operations, who made the announcement, said that Barr has served with Halliburton for 18 years. From his office in Wichita, Kans., he will provide basic and refresher services training, job appraisal and driver training for the northern region.

C. R. Jones is promoted

. . . to the position of general manager, Cooper - Bessemer of Canada, Ltd., according to Charles G. Cooper, chairman of the board and president of Cooper-Bessemer of Canada. Presently vice president and western district manager, Jones has also been elected to the board of directors of the Canadian group. Jones, in his new capacity, will be responsible for all manufacturing and sales activities. Field offices are located at Edmonton, Calgary, Toronto, and Halifax.

C. R. Jones

Fire Boss, Inc., establishes

. . . headquarters in Fort Worth. Engaged in the manufacture and fabrication of self-contained, portable fire-fighting equipment, the firm was founded 2 years ago in Odessa, Tex. Equipment distributed by the firm is specifically designed to combat major oil-industry fires.

A. P. Burris elected president

... of Electric Machinery Manufacturing Co. Succeeding Burris as sales vice president is C. E. Buchan, for-

A. P. Burris

C. E. Buchan

merly general sales manager. These changes result from the election of R. H. Olson, former E-M president, as group vice president of Worthington Corp., the parent corporation of E-M.

Burris joined E-M in 1930, becoming vice president, sales, in 1950. Buchan, Cleveland district manager for 30 years, became general sales manager in 1954.

Ideco-Woodfield full-view mast

... built late last year at Rochester, England, is now operating in Kuwait. The 98-ft. mast was bought by Kuwait Oil Co.. Ltd.

The design provides more working space on the drilling floor with the mast column pedestal located at the extreme edge of the substructure and forward of the drawworks to the pipe ramp.

The driller has unobstructed view of the derrick man and travelling block. The raising mechanism produces such a nominal line pull that even a single-engine drawworks can perform the operation. The mast doesn't go over center when erected.

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HOW TO PRODUCE 3-Dual Completed Wells

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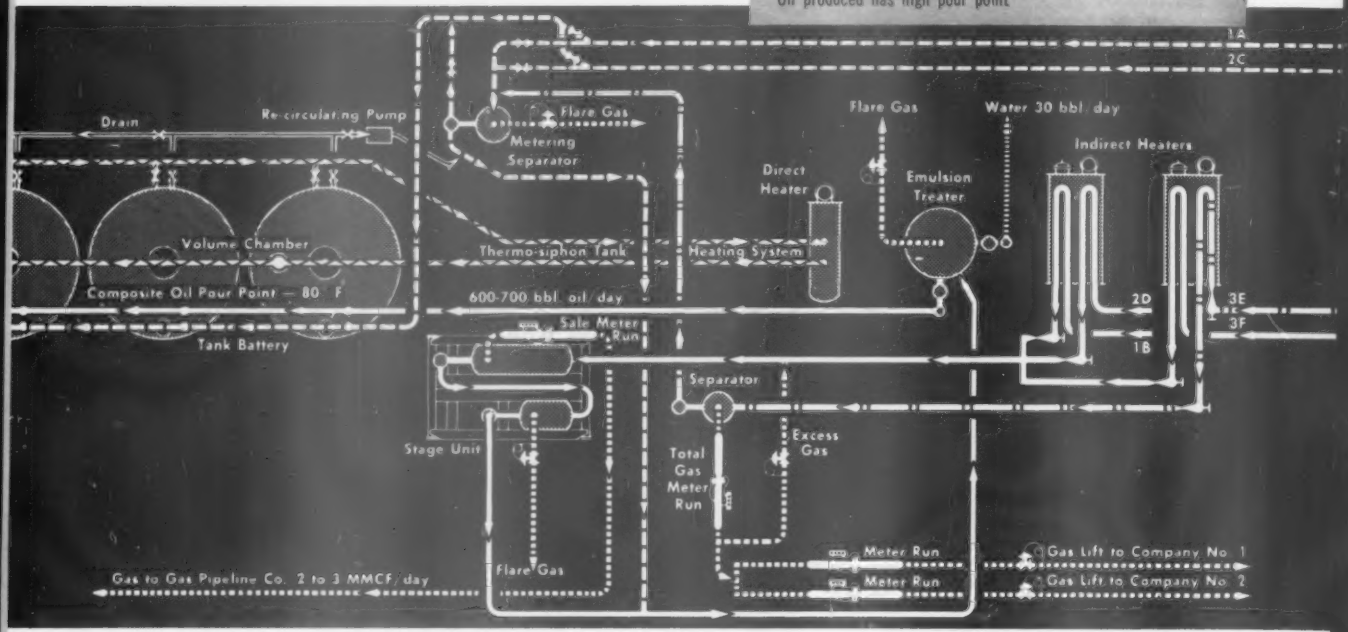
Oil produced has high pour point



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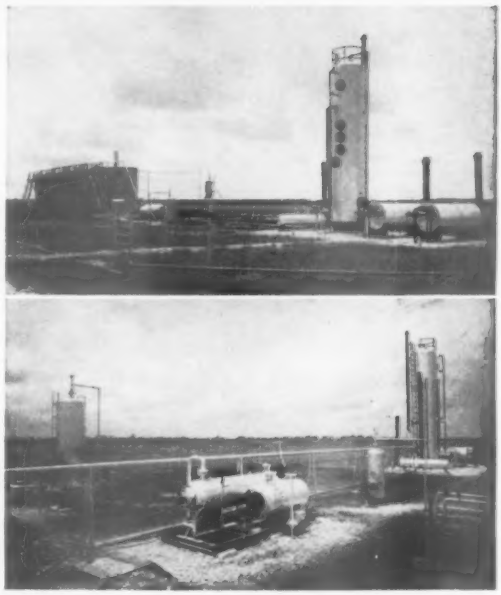

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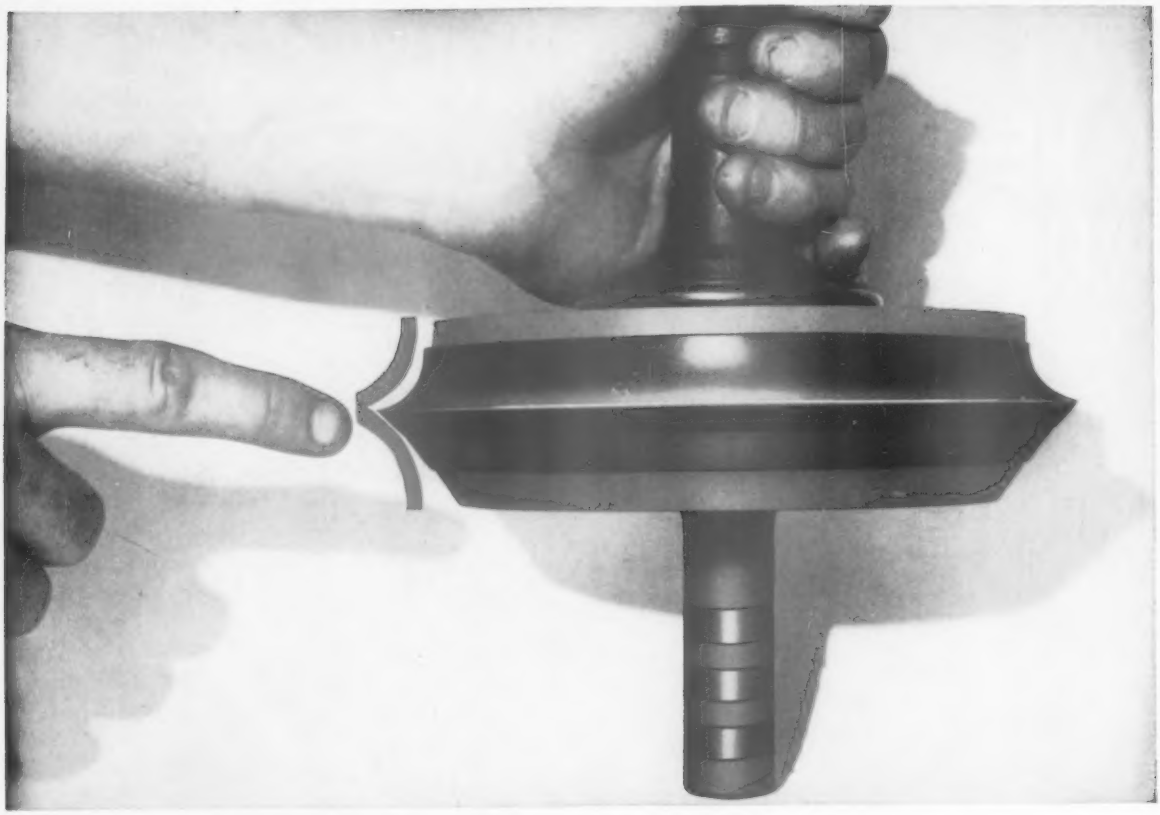

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